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Biological Evaluation of Activities Proposed in Suitable Mexican Spotted Owl Habitat on National Forests in the Southwestern Region

Southwestern Region
USDA Forest Service

July 30, 1992

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Table of Contents

List of Figures ii
List of Tables iii
Summary iv

INTRODUCTION 1
Scope of Analysis 1
Brief Description of the Action 2

BACKGROUND 3
Management Direction 3
Establishment of Management Territories 5
Distribution 7
Home Range Size 7
Habitat 10

SCIENTIFIC BASIS 13

CURRENT SITUATION 21
Overview of the Region 23
Southern Zone 24
Northern Zone 28

PROPOSED ACTIONS 63
Types of Actions 32
Proposed Activities 33

PROCESS 35

DETERMINATION OF EFFECTS 37

FINDINGS AND RECOMMENDATIONS 40

LITERATURE CITED 43

PREPARERS 44

APPENDIX A - Current Situation by Forest 48
APPENDIX B - Determination of Effects by Forest 78

List of Figures

Figure 1. Distribution of the 3 Subspecies of Spotted Owls 8

Figure 2. Distribution of Mexican spotted owl Habitat in the Southwest 9

Figure 3. Mexican spotted owl Suitable and Capable Habitat Types, Southwestern Region . 11

Figure 4. Suitable and Capable Mexican spotted owl Habitat on National Forest Land, Southwestern Region 22

Figure 5. Land Status of Mexican spotted owl Habitat on National Forest Land, Southwestern Region 23

Figure 6. Mexican spotted owl Habitat Complexes and Northern and Southern Zones, Southwestern Region 25

Figure 7. Mexican spotted owl Habitat Management Areas with Number of Management Territories 26

Figure 8. Distances in Miles Between Habitat Management Areas. 30

Figure 9. Suitable Mexican spotted owl Habitat on National Forest Land, Southwestern Region 38

Figure 10. Capable Mexican spotted owl Habitat on National Forest Land, Southwestern Region 39

List of Figures Appendix A

Figure A1. Total number of Management Territories by National Forest, Southwestern Region. Total is 620 as of 1991. 66

Figure A2. Mean Characteristics of 60 Mexican spotted owl Management Territories (MT) on the Apache-Sitgreaves National Forests in Arizona. 67

Figure A3. Mean Characteristics of 3 Mexican spotted owl Management Territories (MT) on the Carson National Forest in New Mexico. 68

Figure A4. Mean Characteristics of 25 Mexican spotted owl Management Territories (MT) on the Cibola National Forest in New Mexico. 69

Figure A5. Mean Characteristics of 82 Mexican spotted owl Management Territories (MT) on the Coconino National Forest in Arizona. 70

Figure A6. Mean Characteristics of 86 Mexican spotted owl Management Territories (MT) on the Coronado National Forest in Arizona. 71

Figure A7. Mean Characteristics of 104 Mexican spotted owl Management Territories (MT) on the Gila National Forest in New Mexico. 72

Figure A8. Mean Characteristics of 3 Mexican spotted owl Management Territories (MT) on the Kaibab National Forest in Arizona. 73

Figure A9. Mean Characteristics of 94 Mexican spotted owl Management Territories (MT) on the Lincoln National Forest in New Mexico. 74

Figure A10. Mean Territory Characteristics of 8 management Territories on the Prescot National Forest in Arizona, Southwestern Region. 75

Figure A11. Mean Territory Characteristics of 19 Mexican spotted owl Management Territories (MT) on the Santa Fe National Forest in New Mexico 76

Figure A12. Mean Characteristics of 34 Mexican spotted owl Management Territories (MT) on the Tonto National Forest in Arizona. 77

List of Tables

Table 1 Extinction rate as a function of mean population size in large-bodied, nonmigrant birds (based on Pimm *et al.* 1988). 15

Table 2 Mean distance between HMAs within a complex, mean distance to nearest complex, and mean distance to proximate complexes stratified by geographic areas. 27

Table 3 Summary of Reigon 3 proposed 1992 actions. 34

List of Tables Appendix A

Table A1 HMAs by Forest. 62

Table A2 Nearest neighbor distance to closest HMA and closest >20 pair HMA or >20 pair HMA cluster. 64

List of Tables Appendix B

Table B1 Proposed activities on the Apache-Sitgreaves National Forests. 86

Table B2 HMAs affected by proposed 92 projects. 86

Table B3 MTs affected by FY 92 activities on the Apache-Sitgreaves National Forests. . . 88

Table B4 Proposed activities on the Carson National Forest. 88

Table B5 Proposed activities on the Cibola National Forest 89

Table B6 MTs affected by FY 92 activities on the Cibola National Forest 91

Table B7 Proposed activities on the Coconino National Forest 92

Table B8 MTs affected by FY 92 activities on the Coconino National Forest 94

Table B9 Proposed activities on the Coronado National Forest 95

Table B10 MTs affected by FY 92 activities on the Coronado National Forest 96

Table B11 Proposed activities on the Gila National Forest 97

Table B12 MTs affected by FY 92 activities on the Gila National Forest 99

Table B13 Proposed activities on the Kaibab National Forest 101

Table B14 Proposed activities on the Lincoln National Forest 102

Table B15 MTs affected by FY 92 activities on the Lincoln National Forest 104

Table B16 Proposed activities on the Santa Fe National Forest 106

Table B17 Proposed activities on the Tonto National Forest 108

Table B18 MTs affected by FY 92 activites on the Tonto National Forest 109

SUMMARY

Biological Evaluation of Continued Application Of Interim Direction to Activities Proposed in Suitable Mexican Spotted Owl Habitat on National Forests in the Southwestern Region

Southwestern Region
USDA Forest Service

July 30, 1992

This is a summary of the biological evaluation process for the continued application of interim guidelines for the Mexican spotted owl to activities proposed in suitable Mexican spotted owl habitat.

Introduction

Purpose and Need

The Mexican spotted owl *Strix occidentalis lucida* was proposed for listing as threatened under the Endangered Species Act (ESA) of 1973 (as amended) on November 4, 1991. No critical habitat was proposed. Region 3 of the Forest Service (FS) had considered it a sensitive species (defined in Forest Service Manual (FSM) 2670.519). Due to the proposed listing it is incumbent upon Federal agencies to review their actions to determine if the actions are likely to jeopardize the continued existence of a proposed species or result in the destruction or adverse modification of proposed critical habitat. If the action agency determines that an action is likely to have these effects then the agency shall confer with the U. S. Fish and Wildlife Service (FWS) as identified in 50 CFR 402.10(a).

Under ESA, the requirement for a proposed species is to determine whether or not the action is likely to jeopardize the continued existence of the Mexican spotted owl or result in destruction or adverse modification of proposed critical habitat. No critical habitat is proposed because the FWS found that it is "not prudent" and procedurally terminated the designation of critical habitat in this proposed listing, unless new information leads them to a different conclusion (November 4, 1991, Federal Register Vol. 56 No. 213, 56344-56355).

In 50 CFR 402.02 jeopardy is defined as follows: "'Jeopardize the continued existence of' means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers or distribution of that species."

In addition to ESA, the National Forest Management Act (NFMA) and its regulations call for maintaining well-distributed populations of native and desired non-native vertebrates. Forest Service policy based on NFMA calls for maintaining populations throughout their geographic range (FSM 2670.22) and avoiding adverse impacts on species while their Federal status is being determined (FSM 2670.31).

The determinations of whether the proposed actions are likely to jeopardize or not meet Forest Service policy based on the National Forest Management Act need to be made for the application of existing direction for the Mexican spotted owl to FS actions proposed for fiscal year 1992 and the first quarter of fiscal year 1993 (subsequently called 1992 actions).

Scope of Analysis

The biological evaluation process (FSM 2672.4) is used to evaluate and document effects of FS programs and activities on Federally-listed threatened, endangered, proposed and sensitive species (TES) and their habitats when projects are proposed to occur in or adjacent to suitable habitats. The objective for threatened, endangered or proposed species is to ensure FS actions

do not contribute to a loss of viability or a trend toward Federal listing. Additionally, sensitive species receive full consideration in the decision-making process.

This biological evaluation supplements biological evaluations completed at the project level. It reviews individual actions and area, Forest, and Region-wide aggregates of those actions which received project level biological evaluations under Forest Service policy for sensitive species.

The current Forest Service policy, Mexican Spotted Owl Interim Directive No. 2 (ID No. 2), directs inventory actions and establishment of Management Territories for all Mexican spotted owl pairs and single owls exhibiting territorial behavior. Management under Interim Directive #2 assumes that, with two years survey of all proposed project areas in or adjacent to suitable habitat and protection of at least the average amount of suitable habitat used by Mexican spotted owls (Ganey and Balda 1988, 1989) wherever territorial individuals and pairs occur in the Southwestern Region, the viability of the sub-species will be retained.

In this biological evaluation, previous findings based on compliance with these guidelines will receive further analysis based on 1) biological concerns which the FWS has identified in response to Forest-level actions which are taking place or which are proposed for FY 1992 and 2) the Forest Service's biological concerns that ID No.2 may not provide for an adequate distribution and size of habitat areas. These concerns and new information since the development of ID No. 2 are factors which warrant review at this time of 1992 actions.

This analysis establishes baseline information and identifies effects of applying ID No. 2 to proposed 1992 actions on reproduction, numbers and distribution of the Mexican spotted owl. The baseline information primarily includes known information concerning reproduction, numbers and distribution up to October of 1991. Effects considered are for the period from October 1991 through January of 1993. All projects that were under contract, except those indicated in the full biological evaluation, were assumed completed and the effects of those actions were considered in the analysis.

This analysis evaluates the application of existing Region 3 direction for the Mexican spotted owl to all activities in or adjacent to suitable owl habitat on the twelve National Forests in the Region for the time period October 1991 to January 1993. These activities include timber harvest, road reconstruction, trail construction, trailhead construction, spring development, campground development, prescribed fire, gas pipeline construction, trail maintenance, fuelwood harvest, and small land exchanges and purchases.

Specific activities under timber harvest include application of group shelterwood, sanitation salvage, intermediate, seed tree, final removal, group selection, clear cut, uneven-aged treatment, and pre-commercial thin prescriptions. These timber management activities are proposed primarily in ponderosa pine and mixed conifer forests and include inter-related and interdependent actions such as road construction and slash treatments activities.

Background

The Mexican spotted owl is historically known from only a few records and occasional observations. The subspecies was listed as sensitive by the Regional Forester of the Southwest Region, USDA Forest Service in 1982. In 1988, Southwestern Regional Forester David F. Jolly formed a Mexican

Spotted Owl Task Force comprised of representatives from the owl research community, Arizona and New Mexico State Game and Fish Departments, New Mexico Audubon Society, U.S. Fish and Wildlife Service (FWS), Kaibab Forest Products, and Forest Service personnel from wildlife, silviculture, planning, public affairs, and management at the Forest and Regional office levels. The task force was charged with developing a biologically based strategy on how to manage owl habitat and recommend guidelines for the Regional Forester to consider for adoption.

In 1989 the Southwestern Region's Mexican Spotted Owl Task Force completed a one and one-half year effort to develop and recommend short term management guidelines for the Regional Forester to use to manage owl habitat on National Forest lands in Arizona and New Mexico. The direction in the guidelines recommended to the Regional Forester was based on the most current biological information available to the task force.

These guidelines were adopted in the June 29, 1989, Federal Register (Vol. 54, No. 124, 27416-27418) and issued in the Forest Service Manual as Regional Mexican Spotted Owl Interim Directive 1 (FSM 2676.2). This interim direction identified how, when and where to conduct inventories prior to any management activities occurring, establishment of a Management Territory, and application of management guidelines. The Region revised and reissued this as Mexican Spotted Owl Interim Directive 2 (Federal Register Vol. 55, No. 127 27278-27287) in July 1990. This revision was based on the recommendations of the Task Force.

The inventory procedures included in the interim directive were designed to provide reasonable assurance no owls were using an area prior to a management activity occurring. It uses a consistently applied, systematic approach that requires 2 years of survey prior to an activity being allowed.

Inventory work to identify owls and their habitat was initiated for proposed projects which could affect habitat or disrupt breeding efforts of the subspecies. Inventory and monitoring protocols were standardized to assure quality and consistency of owl detection efforts. These protocols and habitat protection measures were instituted as regulatory mechanisms in the form of Regional Guidelines (ID Nos. 1 and 2; FSM 2676.2; December 4, 1991, Regional Forester memo to Forest Supervisors).

Inventory work is continuing and monitoring studies have been initiated. The monitoring studies will provide population information for further refinement of management strategies concerning the owl. These studies were designed to document owl reproduction and population changes over as long as 10 years and are reviewed annually. Monitoring data are expected to become most useful in 1995 and beyond.

The petition to list the Mexican spotted owl and subsequent proposed threatened status have accelerated the time frame for making species management decisions. At this time, decisions must be made with incomplete data. The Southwest Region is currently in the process of developing a Mexican Spotted Owl Conservation Strategy and an accompanying National Environmental Policy Act (NEPA) document. These address a long-term conservation strategy. A Notice of Intent, legally announcing this effort to the public, was published in the March 5, 1992, Federal Register (Vol. 57, No. 44, 7907-7908).

Because the conservation strategy has not been completed, the Region is developing this interim evaluation. One need is to determine if the application of existing guidelines to any proposed

action would be likely to jeopardize the continued existence of the Mexican spotted owl and therefore need to go through the conference process with FWS. Activities proposed after the first quarter of FY 1993 will meet the direction provided by the conservation strategy, which will be coordinated with the FWS. If appropriate, the two agencies will follow the conference process for the conservation strategy and resultant direction for management of the Mexican spotted owl.

In addition, this analysis will determine whether proposed FY 92 activities meet National Forest Management Act and Forest Service policy requirements for sensitive and proposed species.

Based on discussions with FWS, the Region initiated conferencing meetings on the owl with the FWS on March 31, 1992. Conferencing information was provided for the 1992 actions on the Carson and Apache-Sitgreaves National Forests. In this meeting, the Forest packages were presented to the FWS. Between April 17, 1992, and May 5, 1992, similar packages for the Lincoln, Santa Fe, Coronado and Tonto Forests were sent to FWS.

On May 1, 1992, the FWS sent recommendations on the 1992 Carson and Apache-Sitgreaves National Forests' 1992 actions. On May 15, 1992, the FWS sent letters to the Forest Service regarding the Lincoln and Santa Fe 1992 actions, stating that conference was not appropriate, as the action agency (FS) had not determined that the actions were likely to jeopardize the continued existence of the owl. However, the FWS also identified proposed actions on several Forests as "likely to jeopardize", in letters dated May 15, 1992.

Actions

One hundred twenty eight actions are proposed for the Southwestern Region. These activities, primarily timber harvest, will harvest about 238 million board feet of timber from over 91,300 acres. Of this acreage where modifications to the existing stand structure will occur, just over 14,900 acres (16 percent) are to occur in Mexican spotted owl habitat.

Nearly half of the proposed activities propose to modify no or fewer than 10 acres of suitable Mexican spotted owl habitat (Category 1). Sixty one activities modify a total of only 33 acres of suitable spotted owl habitat, even though almost 54,000 acres will be treated.

Nearly half (42 percent) of the volume proposed for harvest this fiscal year would come from proposed activities which would modify 250 or more acres of suitable habitat (Category 3). This harvest volume is proposed to come from slightly over 29,000 acres, 32 percent of the total acreage. Forty percent of these 29,000 acres is in Mexican spotted owl habitat. These sales make up 79 percent of all acres of spotted owl habitat proposed for modification this year.

Projects which would harvest between 10 and 250 acres of suitable habitat (Category 2) make up the remaining 21 percent of the spotted owl habitat to be modified this year.

Of the 3.365 million acres of suitable spotted owl habitat in the Region, the amount to be harvested this fiscal year amounts to just over 0.4 percent. Some stands proposed for treatment would still exceed 60 or 70 percent canopy closure, after treatment, with trees greater than 14 to 16 inches in diameter.

All individual actions will meet standards of ID No. 2 and will have individual biological evaluations and NEPA documentation.

Process

The lack of Mexican spotted owl information concerning reproduction, survival, dispersal and other parameters precludes a quantitative population analysis at this time. An assessment which considered only acres affected and known Mexican spotted owls affected is insufficient without taking into account spatial considerations.

Examination of landforms and known Mexican spotted owl locations suggest that island biology theory (Diamond 1975; Harris 1984) is applicable to assessing the Regional landscape. The best scientific information available relating island biology theory to spotted owls is the Interagency Scientific Committee Report for the Northern spotted owl (Thomas et al. 1990). We have examined this work and have applied the basic concept to assess the Mexican spotted owl as it is presently distributed in the Region. This assessment provides the basis for our opinion of the overall security of the sub-species within the Region and serves as a basis to judge spatial effects of 1992 actions on the Regional matrix of Mexican spotted owls and associated habitat.

The spatial assessment used a map process which overlaid maps of Mexican spotted owl Management Territories, suitable habitat, acres inventoried for Mexican spotted owls, proposed actions and potential Habitat Management Areas, patterned on the proposal of the Interagency Scientific Committee.

The known Management Territories provided the initial layer of information. Other (non-territorial) Mexican spotted owl occurrences were also considered. This included locations which are outside of Arizona and New Mexico, expected Mexican spotted owls on ownerships such as the White Mountain Apache or Mescalero Apache Indian Reservations and historic observations of Mexican spotted owls in areas of forested habitat as well as areas which have no habitat potential but represent anecdotal dispersal information.

The Habitat Management Area (HMA) layer identified clusters of known Management Territories in the present landscape. HMA's were developed for the conservation strategy. HMAs were assumed to have a high probability of interaction of owls within. The aggregation of HMAs into Complexes and zones was delineated by considering landform, vegetation, owl occurrence information and professional judgement on how these areas share common forms or functions in a landscape view of the Regional matrix. Examination of biotic communities (Brown and Lowe, 1980), ecoregions (Bailey, 1976), potential natural vegetation (Kuchler, 1964) and terrestrial ecosystems (Forest Service, 1992) were used in forming opinions about patterns of owl occurrence, expected additional occurrences, and habitat in a Regional context.

The suitable habitat layer was used for consideration of habitat distribution and relative fragmentation at a HMA, Forest and Complex scale. The biotic community mapping mentioned previously provided insight into natural fragmentation at a landscape scale. The suitable habitat maps varied greatly in the degree of refinement each Forest was able to provide.

The layer displaying inventoried areas served as a guide for considering what is known about Mexican spotted owl occurrence and what additional owls may be expected to occur in uninventoried portions of the landscape.

The proposed actions were mapped to show each action's general location within the landscape. Detailed mapping can be located in the project record for each proposed action at the field level. The general location information was sufficient for our consideration of where actions were proposed relative to HMAs and Management Territories, and expected owl occurrence on other areas.

The combination of all these information layers provided the basis for evaluating how portions of the Regional Mexican spotted owl occurrence and habitat matrices may function and allowed identification of areas which are of concern, based on presently available information.

Proposed projects were examined in relation to concerns about the portion of the Regional matrix in which they occurred, the amount of suitable habitat which would be changed in quality to capable habitat, and the occurrence of
owls. All ongoing activities and those under contract were assumed completed for purposes of this analysis and the effects of those actions were considered.

Because the Northern New Mexico Complex was viewed as an area of concern, personnel from the Santa Fe National Forest and the Cibola National Forest were requested to meet with the Biological Evaluation Review Team. They provided more detailed information concerning owls, habitat and projects.

Information analysis was reviewed and recommendations for the FY 92 program were developed. Effects on the Regional owl population were assessed to make a determination of effect for the proposed actions assessed in this biological evaluation.

Conclusions

ALL FORESTS:

This analysis was based on the premise that all activities will be in compliance with ID No. 2. Each Management Territory should include a minimum of 1000 acres of suitable habitat, if available, to be in compliance with the Directive.

Prior to any projects proceeding, Forest Supervisors should assure that the activities have been reviewed by biologists and silviculturists for full compliance with ID No. 2. Also, utilize opportunities to retain adjacent suitable habitat where there are fewer than 1000 acres of suitable habitat in a Management Territory and the habitat would improve the Territory. Document this analysis. The findings that follow are based on the assumption that these two conditions have been met.

SOUTHERN ZONE (Prescott, Tonto, Coconino, A/S, Gila, Lincoln, Coronado, and the Magdalena and San Mateo Mountains of the Cibola National Forest):

SITUATION (Southern Zone):

The density of owls in the southern zone is high, with clusters of owls which are very likely to interact. Many of the areas have owl Management Territories in clusters in excess of 20 pairs. This fully meets the standards set by the ISC for long-term management of the Northern spotted owl. These clusters are well distributed across this zone. FY 92 actions will affect a minor amount of suitable habitat acres. Although these small portions of the habitat will be temporarily degraded, it is expected that most if not all present pairs would be retained, but some reproduction could be affected. The persistence of clusters of owls would not be appreciably reduced. It is very unlikely that this would contribute to a loss of viability of the Mexican spotted owl. Persistence of Mexican spotted owls in this portion of the range is likely both in the short and long term.

FINDING (Southern Zone):

The individual and cumulative actions proposed for FY 92 may effect indirectly individual owls and their reproduction but will not cause the loss of population viability, reduce the distribution of the subspecies, or foreclose future management options. These actions are not likely to jeopardize the continued existence of the Mexican spotted owl. Continued management under Interim Directive No. 2 is not expected, directly or indirectly, to reduce appreciably the likelihood of survival of the subspecies by reducing reproduction, numbers or distribution.

NORTHERN ZONE (Kaibab, Carson, Santa Fe, and Cibola National Forests except the Magdalena and San Mateo Mountain ranges)

SITUATION (Kaibab and Carson National Forests):

Kaibab and Carson National Forests: These two Forests are on the northern extremes of the range for the owl and probably as a result, known occupancy of what would appear to be suitable habitat is very low. Any reproductive efforts in this portion of the range are very important to persistence of the Mexican spotted owl in this portion of its range. The only known reproductive pairs are on the southern part of the Kaibab and on the disjunct, Jicarilla Mountain portion of the Carson.

FINDING (Kaibab and Carson National Forests):

No activities on either Forest will affect any Management Territories nor cause any sizeable degradation of dispersal habitats. Actions could affect unoccupied, apparently suitable habitat, although the question remains whether this habitat is actually suitable. Although there is a small possibility of affecting individual owls, there would be no effect on viability or distribution of the subspecies. These actions will not foreclose any future conservation measures and will not jeopardize the continued existence of the subspecies

SITUATION Santa Fe and Cibola National Forests (except Magdalena and San Mateo Mountains):

Considerable analysis and review of existing information on the status of the owl in this portion of its range occurred as well as review of proposed activities for FY 92. Existing data suggests that low occupancy and reproductive problems may be occurring in this portion of the range. Compounding this concern is the fact that subpopulations are linked over greater dispersal

distances than in other parts of the range. Each link in this stretched chain may be very important for dispersal as well as reproductive needs. Those small populations that do exist in this portion of the range do not meet the cluster standard of 20+ pairs set for the Northern spotted owl for stability. These factors caused the Biological Evaluation Review Team considerable concern regarding any activities which would degrade habitat in this portion of the range.

In the Jemez Mountains, small clusters of owls occur and they likely interact. None of these clusters have 20 pairs, although they collectively total over 20 pairs. It may be that these small clusters interact readily and function as would a 20-pair area. However, this is not known and until further data on reproduction and occupancy are obtained and analyzed, caution should be exercised.

The Santa Fe and Cibola Forests likely support breeding and dispersing owls that maintain a sizeable portion of northern parts of the range.

FINDING (Santa Fe and Cibola National Forests, except Magdalena and San Mateo Mountains):

With our concern for the owl in this portion of its range and with the lack of solid reproductive and occupancy information, our recommendation is to be biologically conservative until a conservation strategy is implemented. Avoid actions which would affect the potential to support 20+ pairs in clusters. The individual and collective actions proposed may adversely effect both individuals and reproduction, by reducing habitat, in this portion of the owl's range. However, continued management of the owl under Interim Directive #2 is not expected, directly or indirectly, to reduce appreciably the likelihood of survival of the subspecies. Therefore, it would not jeopardize the continued existence of the owl.

Because of the apparent tenuous nature of the the owl on these Forests as identified by the Biological Evaluation Review Team, there is a concern that 1992 actions would contribute to a loss of distribution in this portion of the subspecies' range. We recommend that until a long-term conservation strategy is adopted, no suitable habitat be modified in a way which would cause it to become less than suitable and any modifications in capable habitat should serve only to accelerate its growth toward suitability. If this recommendation is followed, the finding would be that the proposed 1992 actions will have no effect on individuals or on the population and no effect on the range of the subspecies.

Reviewed By: Sandy Knight Date: *7/30/92*
Sandy Knight
Asst. Regional TES Biologist

Reviewed By: E. Leon Fisher Date: *7/30/92*
E. Leon Fisher
Regional TES Biologist

INTRODUCTION

Purpose and Need

The Mexican spotted owl, *Strix occidentalis lucida*, was proposed for listing as "threatened" under the Endangered Species Act (ESA) of 1973 (as amended) on November 4, 1991. No critical habitat was proposed. The Forest Service's (FS) Southwestern Region considers it a sensitive species (defined in Forest Service Manual FSM 2670.519). Due to the proposed listing, federal agencies must consider whether their actions are likely to jeopardize continued existence of a proposed species or destroy or adversely modify proposed critical habitat. If the action agency determines that an action is likely to have these effects, then that agency shall confer with the U. S. Fish and Wildlife Service (FWS) as identified in 50 CFR 402.10(a).

Under ESA, the requirement for a proposed species is to determine whether or not action is likely to jeopardize the continued existence of the species or result in destruction or adverse modification of proposed critical habitat. No critical habitat is proposed for the Mexican spotted owl (owl) because FWS found it "not prudent" and procedurally terminated designation of critical habitat in this proposed listing, unless new information leads them to a different conclusion (November 4, 1991, Federal Register Vol. 56 No. 213, 56344-56355).

In 50 CFR 402.02, "jeopardy" is defined as follows: "'Jeopardize the continued existence of' means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species."

In addition to ESA, the National Forest Management Act (NFMA) and its regulations call for maintaining well-distributed populations of native and desired non-native vertebrates. Forest Service policy based on NFMA calls for maintaining populations throughout their geographic range (FSM 2670.22) and avoiding adverse impacts on species during the period it is proposed for listing and while their Federal status is being determined (FSM 2670.31).

Determinations of whether proposed actions are likely to jeopardize or not meet Forest Service policy based on the National Forest Management Act must be made for application of existing direction for the owl to FS actions proposed for Fiscal Year 1992 and the first quarter of Fiscal Year 1993 (subsequently called "1992 actions").

For brevity's sake, the Mexican spotted owl will be referred to in this document as "the owl."

Scope of Analysis

When projects are proposed to occur in or adjacent to suitable habitats, the biological evaluation process (FSM 2672.4) is used to evaluate and document effects of FS programs and activities on federally listed and proposed "threatened" and "endangered" species, species listed as "sensitive" by the FS, and the habitats of those sensitive species. The objective

for threatened, endangered, or proposed species is to ensure FS actions do not contribute to loss of population viability or, for sensitive species, a trend toward federal listing.

This biological evaluation (BE) supplements BE's completed at the project level. It reviews individual actions and area, Forest, and Regionwide aggregates of 1992 actions that received project-level BE's under FS policy.

The current Forest Service policy, Mexican Spotted Owl Interim Directive No. 2 (ID No. 2), directs inventory actions and establishment of Management Territories for owls for all pairs and single owls exhibiting territorial behavior. Management under this interim directive assumes that the viability of the sub-species will be retained where two years' survey of all proposed project areas in or adjacent to suitable habitat have been completed and protection of at least the average amount of suitable habitat used by the owl has been assured (Ganey and Balda 1988, 1989) wherever territorial individuals and pairs occur.

This BE includes analysis on 1) biological concerns FWS identified by the response to forest-level actions occurring or proposed for Fiscal Year 1992, and 2) the Forest Service's own biological concern that ID No. 2 may not provide for an adequate distribution habitat. These concerns and new information since development of ID No. 2 are factors that warrant review at this time for 1992 actions.

This analysis identifies effects of proposed FS actions in 1992 that may affect reproduction, numbers, and distribution of the owl. The baseline information gathered includes known information concerning reproduction, numbers and distribution up to October 1991. Effects are considered from October 1991 through January 1993. All projects that were under contract, except those indicated in the tables in the "Effects" section, were assumed completed and effects of those actions were considered in the analysis.

Brief Description of the Action

This analysis evaluates application of existing Southwestern Region direction for the owl to all proposed activities in or adjacent to suitable owl habitat on the twelve national forests in the Region. Activities include timber harvest, road reconstruction, trail and trailhead construction, spring development, campground development, prescribed fire, gas pipeline construction, trail maintenance, fuelwood harvest, and small land exchanges and purchases.

Specific timber harvest activities include group shelterwood, sanitation salvage, intermediate, seed tree, final removal, group selection, clearcut, uneven-aged treatment, and pre-commercial thinning prescriptions. They occur primarily in the ponderosa pine and mixed conifer vegetation types and include interrelated and interdependent actions such as road construction and slash treatments.

BACKGROUND

Management Direction

The Mexican spotted owl is historically known from only a few records and occasional observations. The subspecies was listed as "sensitive" in 1982 by the Regional Forester of the Southwestern Region of the USDA Forest Service. In 1988, Southwestern Regional Forester, David F. Jolly, formed a Mexican Spotted Owl Task Force comprised of representatives from the owl research community, Arizona and New Mexico State Game and Fish Departments, New Mexico Audubon Society, U.S. Fish and Wildlife Service, Kaibab Forest Products, and Forest Service personnel from wildlife, silviculture, planning, public affairs, and management at the forest and Regional Office levels. Their charge was to develop a biologically based strategy to manage owl habitat and recommend management guidelines for the Regional Forester to consider for adoption.

In 1989, the Owl Task Force completed short-term management guidelines to manage owl habitat on national forests in Arizona and New Mexico. Direction in the guidelines recommended to the Regional Forester was based on the most current biological information available.

The objectives were:

1. Identify the condition and management of habitats sufficient to maintain reproductive pairs.

2. Ensure adequate search efforts in suitable owl habitat before any management activity.

3. Standardize procedures used to inventory and monitor owl habitat.

4. Identify procedures to establish core areas and management territories (MTs) based on inventory, monitoring, and other data.

5. Provide for multiple-use management in owl MTs consistent with maintaining spotted owl viability.

These guidelines were adopted on June 29, 1989, Federal Register (Vol. 54, No. 124, 27416-27418) and issued in the Forest Service Manual as Regional Mexican Spotted Owl ID No. 1 as FSM 2676.2. The Region revised and reissued this as Mexican Spotted Owl ID No. 2 (Federal Register Vol. 55, No. 127 27278-27287) on June 26, 1990. This revision was based on the recommendations of the Task Force, and identified how, when, and where to 1) conduct inventories before any management activities occurred, 2) establish a MT, and 3) apply management guidelines.

Inventory procedures were designed to provide a reasonable assurance of finding owls before a management activity occurred. It is a consistently applied, systematic approach requiring two years of survey before an activity is allowed.

Inventory work to locate owls and their habitat was initiated for proposed projects that could affect habitat or disrupt breeding efforts. Inventory and monitoring protocols were standardized to assure quality and consistency of owl detection efforts. These protocols and habitat protection measures were instituted as regulatory mechanisms in the form of Regional Guidelines (IDs No. 1 and No. 2; FSM 2676.2; December 4, 1991, Regional Forester memo to forest supervisors).

Inventory is continuing and monitoring studies have been initiated to provide population information to further refining management strategies. These studies were designed to document population changes over 10 years. Monitoring data will become useful in 1995 and beyond.

The proposed listing has accelerated the time-frame for making management decisions. The Southwestern Region is developing a Mexican Spotted Owl Conservation Strategy and an accompanying National Environmental Policy Act (NEPA) document. Both address a long-term conservation strategy. A Notice of Intent, legally announcing this effort to the public, was published in the Federal Register on April 7, 1992 (Vol. 57, No. 44, pages 7907-7908).

Because the Conservation Strategy has not been completed, the Region is developing this interim evaluation to determine if the application of existing guidelines (to any proposed FS action) would jeopardize continued existence of the owl. Activities proposed after March 1993 will meet the direction provided by the Conservation Strategy. Where appropriate, the FS and FWS will follow the conference process for the Conservation Strategy.

In addition, this analysis will determine whether proposed FY 1992 activities meet National Forest Management Act and Forest Service policy requirements for sensitive and proposed species.

The FS, based on a good faith effort entered a conference with FWS to get their comments on the proposed 92 actions, the Region initiated conference meetings with the FWS on March 31, 1992. Conferencing information was provided for the 1992 actions on the Carson and Apache-Sitgreaves National Forests. In the April 10 meeting, the Forests' packages were presented to the FWS. Between April 17, 1992, and May 19, 1992, similar packages for the Lincoln, Santa Fe, Coconino, and Tonto National Forests were sent to FWS.

On April 27, 1992 and May 1, 1992, the FWS provided comments to the Regional Forester on the 1992 actions on the Apache-Sitgreaves and Carson National Forest's activities and, on April 27, 1992, sent recommendations on the Apache-Sitgreaves National Forests' activities. On May 15, 1992, the FWS sent letters to the Regional Forester regarding the Lincoln and Santa Fe 1992 actions, these letters stated that conference was inappropriate because the action agency (FS) had not determined that the actions were likely to jeopardize the owl's continued existence. However, in three of those letters, the FWS also identified proposed actions on several forests as "likely to jeopardize."

Establishment of Management Territories

Once a spotted owl is located, a MT is established, which is 2,000 acres or larger and includes at least a 450-acre "core area." Core-area size is based on the 60-percent activity-center average of 390 acres with additional acreage added to ensure protection of the activity center. ID No. 2 maintains 1,000 or more acres of suitable habitat within the MT wherever possible and provides as large a patch of contiguous suitable habitat around the core area as possible.

The district wildlife biologist locates the MT and core area. The MT boundary is established using nighttime observations of owls in this MT. Terrain features and foraging habitat are also used to help locate MT boundaries. The core area is located in what appears to be the most suitable activity center habitat and includes known nest and day roost sites. Core areas are often located before a nest or roost site has been located. When this occurs, the district biologist uses professional judgement, past experience at locating core areas, help from other spotted owl biologists, and nighttime locations to establish the core area. Searches continue in order to locate nest and roost sites. Adjustments to the core boundary are made once a nest or roost is found, if warranted.

Management direction allows for stand-modifying activities in up to 516 acres of the MT with no modification of the core. Also included are the areas where past natural events (wildfire or blow-down) have changed 'suitable' habitat to 'capable' habitat. All private lands or lands of other ownership are considered unsuitable. Under rare circumstances the acreage where activities are allowed can be increased to 775 acres.

Because of social and economic concerns, the Regional Forester decided to allow the Lincoln and Gila National Forests to have a smaller MT size than the rest of the Region. Instead of 2,000 acres, they were allowed 1,500 acres, based on an owl relative-density study done on the Lincoln National Forest, which found an average of slightly over 1,500 acres used per pair or single owl found in study units. The amount of area where activities are allowed was also reduced to a maximum of 500 acres for these two Forests. Both Forests are still retaining 1,000 acres of suitable habitat and a large, contiguous patch of suitable habitat that incorporates the core area.

Since 1984, the Southwestern Region has conducted administrative studies to determine the owls home range, habitat use, and prey species relationships. In 1989, the Region increased the number of studies to reduce the time required to develop permanent guidelines (references to studies 1989-92). This interim strategy is designed to protect pairs, provide a base so as not to preclude long-term strategies, and allow wide flexibility in adopting new guidelines.

The interim strategy will retain territorial single birds, pairs, and associated habitat to allow for successful reproduction. On larger scales such as a watershed, forest, or region, this approach may or may not fully provide for the species when considering spatial and temporal concerns for habitat. The present strategy aggregates MTs into larger units of interrelated owls and habitats and should retain a functional owl subpopulation. Areas containing few owls are expected to be less resilient because they function as isolates rather than as subpopulations.

Implementing the ID created a disparity between projected timber harvest levels, identified in forest land management plans, and actual harvest levels. The actual rate of harvest is much lower than planned on forests with large numbers of MTs. Forests with relatively low numbers of owls do not have significant differences between planned and actual harvest rates.

To date, there have been 620 MTs identified in the Southwestern Region; from a high of 130 territories on the Gila National Forest in central New Mexico to a low of 3 on the Carson National Forest in northern New Mexico. Nearly 70 percent of these territories have been found in mixed conifer habitat types, with an additional 17 percent in pine/oak types. The remaining 13 percent are in ponderosa pine and other types.

Shortly after completing Mexican Spotted Owl ID No. 1, the Region developed a five-year inventory, monitoring, administrative study, and research program. This program was designed to increase the body of knowledge available on the owl's biology, home range, and habitat use, structure, and conditions.

This information will provide the basis for a long-term strategy to conserve the owl. The 1994 field season will provide the fifth year of data.

Ninety to ninety-five percent of these MTs have at least a single owl present each year. Pairs occupy over 70 percent of the territories annually. Nearly 72 percent of these pairs raise an average of one young per year.

Single MTs more than 3-4 miles from each other is uncommon. Over 80 percent of the MTs are in groups of five or more, with an average of 2.4 miles between territories with a range of 1.5 to 3.8 miles. It is very common to have MT boundaries touch or overlap. Overlap of adjacent owl habitat occurs in the Pacific northwest, northern spotted owl home ranges overlap by 25 percent in areas where fragmentation is not very extensive (Thomas *et al.* 1990). Home range size increases as fragmentation increases.

An average MT (N=359) is 2,055 acres in size, contains nearly 1,150 acres of suitable habitat, and has over 1,000 acres of this in a contiguous patch. Less than 155 acres is old-growth. The

remaining MT acreage is either unsuitable (370 acres) or capable habitat (535 acres). Neither meets suitable habitat conditions, but capable habitat has potential to become suitable in the future. Capable habitat is generally where past activities (man-made or natural) have modified the habitat. Cores average just over 500 acres in size and contain about 410 acres of suitable habitat.

Distribution

The Mexican spotted owl is distributed from the southern Rocky Mountains of Colorado and the Colorado Plateau in southern Utah southward through Arizona and New Mexico and into portions of Mexico (FWS 1991). Most of the surveys conducted for this subspecies have been the result of efforts by the Forest Service on national forests. There are two other subspecies of spotted owl; the northern spotted owl (*S.o. caurina*) and the California spotted owl (*S.o. occidentalis*). Their ranges are shown in Figure 1. Figure 2 shows the Mexican subspecies range in the United States. In addition to morphological differences, recent genetic studies have shown genetic differences between the California and Mexican subspecies.

The owl's present range is thought to be similar to the subspecies' historic range: sparse occupation in the northern portion of the range, while mountain ranges in southern New Mexico and the Mogollon Rim in Arizona are more densely populated.

The northern spotted owl coincidentally, has the lowest population densities in the state of Washington (north), increasing southward through Oregon and California (Thomas *et al.* 1990).

Home Range Size

A 1986-87 radio telemetry study has shown the home range of a pair of owls averages 2,100 acres (Ganey and Balda, 1988). The sample size was small (six birds) but the information has been extensively used as it represents the best available. The study showed spotted owls do not use all of the home range equally. They have areas of concentrated use (activity centers) where they spend a majority of their time. Activity centers include nest areas, day roost sites, and frequently used foraging areas. Two sizes of "activity centers" were identified. The first, averaging just under 390 acres, approximates the area used by a pair 60 percent of the time, and the other area averages about 960 acres and includes more foraging areas than were found in the smaller activity center. Ganey and Balda, (1988) found an average of 995 acres of suitable habitat within the home range. Also, the average patch size of contiguous suitable habitat was about 660 acres.

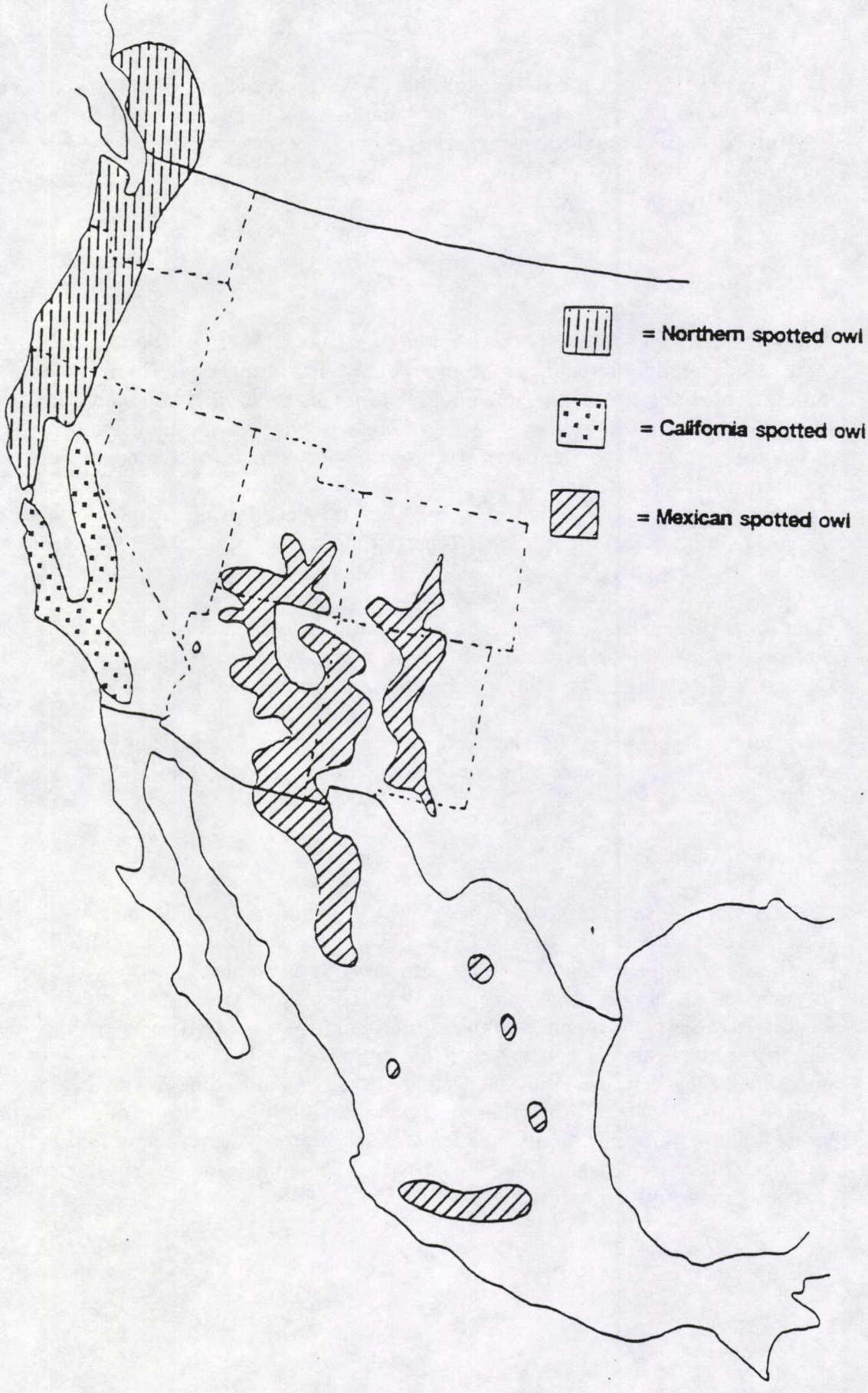


Figure 1. Distribution of the 3 Subspecies of Spotted Owls.

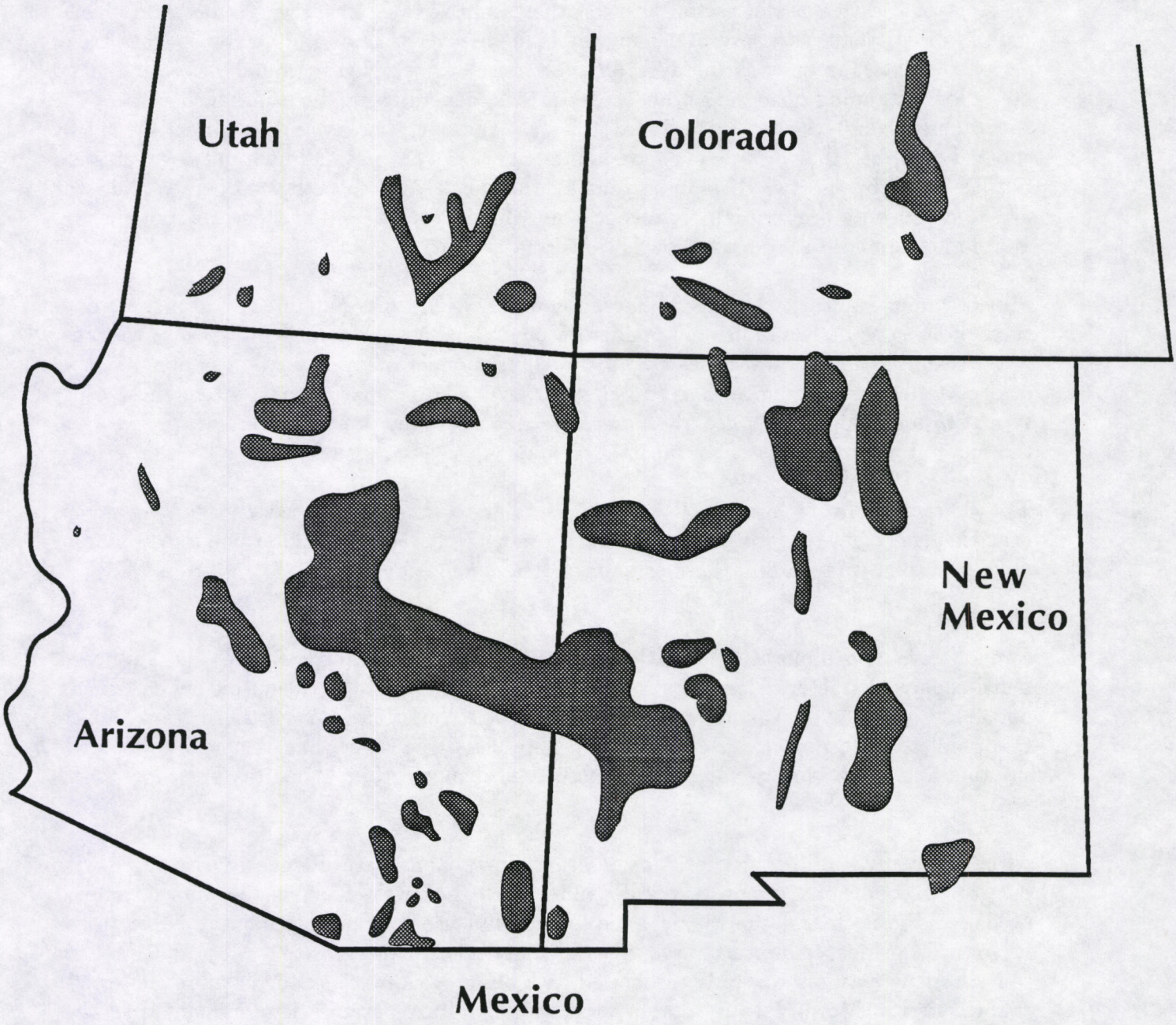


Figure 2. Distribution of Mexican spotted owl Habitat in the Southwest.

Habitat

Owl habitat is best identified by structural characteristics (Ganey *et al.* 1986, Ganey and Balda 1989, and Kroel and Zwank 1991). Characteristics found in activity centers include a moderately dense to dense overstory with a canopy closure of 70 percent or more (that is, most of the tree branches touch each other so little open space is left between them); multi-storied stand with several canopy levels in the overstory and understory (trees are of various heights); an open shrub layer; an open to moderately dense ground vegetation layer; down logs; standing dead snags; and steep slopes, generally greater than 40 percent. The shrub and ground vegetation layers, down logs, and rocky areas are not directly used by spotted owls, but they do provide good habitat for many of the small mammals, insects, and reptiles eaten by the owl. It is important for the shrub layer to be fairly open to allow the owl to capture its prey. Small clumps of dense shrub cover help maintain prey populations and do not appear to reduce the owl's capturing ability.

Mixed conifer habitat types are the most frequently used types (Figure 3) and include mixtures of Douglas-fir, white fir, and ponderosa pine. The fir species make up most of the trees in the stand. Other habitat types used include pure ponderosa pine, ponderosa pine/Gambel oak, cottonwood riparian, evergreen oak riparian, and Arizona cyprus. Often, these other types are found in a small geographic area (Arizona cyprus or evergreen oak) primarily in the mountains or canyons of southeast Arizona.

The characteristics of foraging habitat are similar to those of the activity centers except that they may have a more open overstory canopy, They often include ponderosa pine or ponderosa pine/pinyon pine/juniper habitat types.

Canyons are also important for owls. The canyon wall may replace much of the closed, multi-canopy character of forests normally used. This is especially true in southeast Arizona, northern New Mexico, Colorado, and Utah. In fact, owls found in northern New Mexico, Colorado, and Utah occur in canyons with much less tree cover than is normally found in suitable habitat, and may not use the more typical mixed conifer habitat present in these areas.

Although many of the characteristics describing owl habitat are frequently associated with old-growth conditions, the owl is not dependent on old-growth. Some of the suitable habitat used is old growth and the Mexican subspecies will use it. Suitable habitat is comprised of younger stands containing large trees associated with old-growth. Most older stands contain many features generally associated with old-growth but lack one or more old-growth characteristics. More typically, stands of suitable habitat contain a few remnant trees (per acre) or small patches of old-growth. Small patches or individual trees add diversity and are important components of activity center habitat.

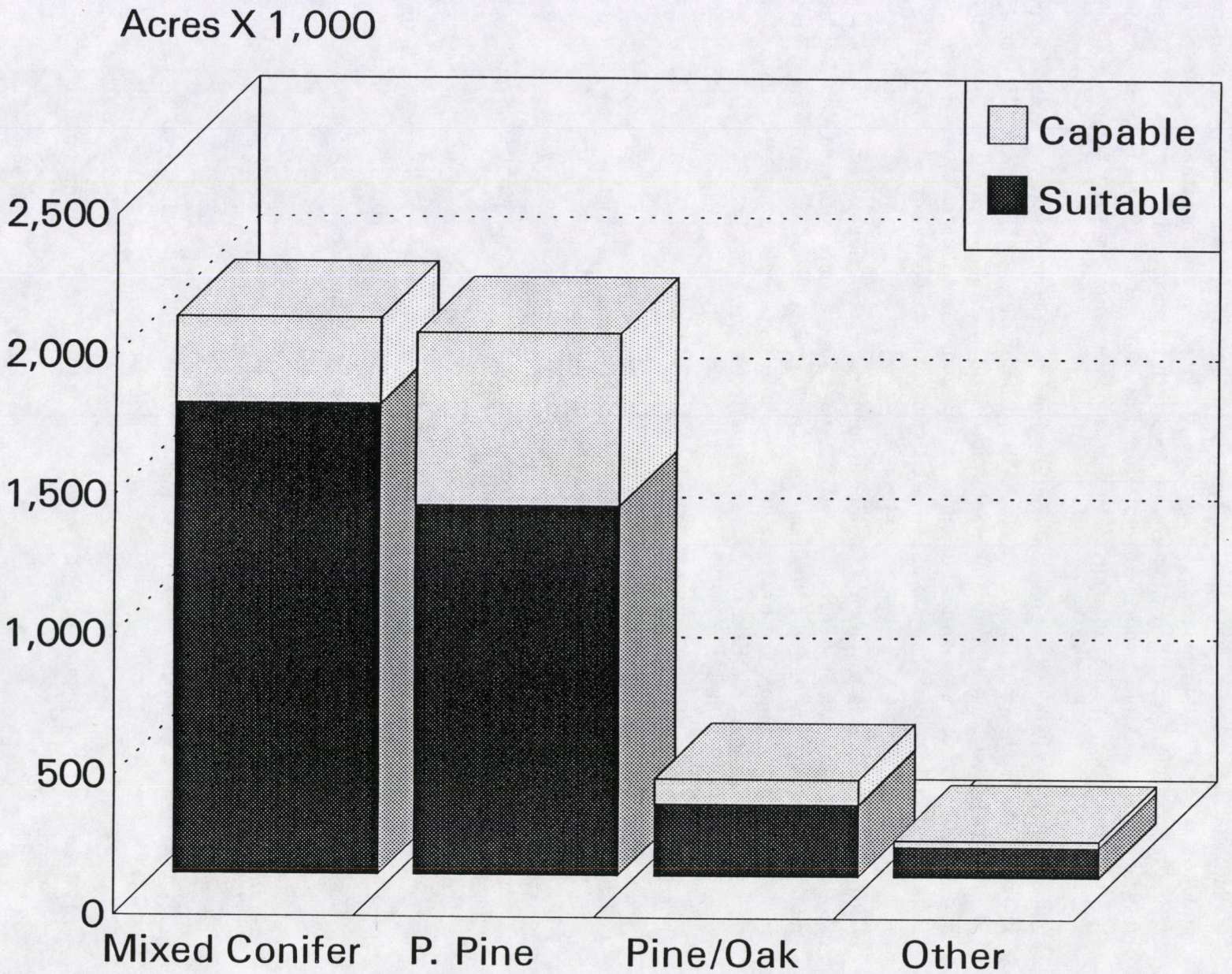


Figure 3. Mexican spotted owl Suitable and Capable Habitat Types, Southwestern Region.

SCIENTIFIC BASIS

This BE is based on the most current information available. It provides a theoretical basis for assessing effects of the 1992 FS project program on population viability and distribution of the owl. It is based on biological principles that describe interactions within and among subpopulations depending on habitat availability. During this evaluation we consulted the Report of the Interagency Scientific Committee which is considered to be the state of the art for the conservation of the northern spotted owl (Thomas *et al.* 1990). Concepts discussed in this BE are part of the Mexican Spotted Owl Conservation Strategy being developed .

The likelihood a wildlife population will continue to exist in an area into the future is known as its "viability" (Thomas *et al.* 1990). A population with high viability has a high likelihood of persisting. Maintaining population viability entails ensuring adequate amounts and distributions of resources for life needs. Populations should interact and be large enough to prevent declines over a period of at least a century or longer (Thomas *et al.* 1990).

Ultimately the goal is to provide for long term genetic evolution, on the order of tens of thousands of generations (Thomas *et al.* 1990). Smaller more isolated populations are more susceptible to higher viability risks than are larger, interacting populations. Viability is increased when populations and habitats for breeding, feeding, dispersal, and other life needs occur in widely distributed, contiguous patterns.

The following conditions affect viability (Thomas *et al.* 1990):

Environmental variation–which results in low survival and reproductive rates–such as fluctuations in prey densities or periods of harsh weather.

Environmental catastrophes–which result in direct habitat loss, population reduction, or isolation–such as wildfire, windstorms, and volcanoes.

Local increases in other species, especially predators, competitors, parasites, and disease.

Systematic habitat loss–such as the widespread and rapid conversion of old forests to young forests–by natural occurrences and human activities.

Forest stand fragmentation–of owl habitat at both local or regional scales.

Connectivity loss, resulting in uneven distribution of spotted owl habitat across physiographic provinces.

Random variation in survival and fecundity among individuals within small, isolated populations.

Loss of genetic variation or length of time in a genetic bottleneck, resulting in reduced fecundity and adaptability, and increased mortality rates, especially in small, isolated populations.

Smaller and more isolated populations are more vulnerable to genetic, demographic, and environmental perturbations.

Metapopulations (or subpopulations), sets of populations linked by dispersing individuals, allow for recolonization of unoccupied habitat patches after local extirpation events. The term "island" applies to habitat islands, as well as true islands. True islands are surrounded by a medium that may function well as a dispersal agent but will not suffice as habitat for terrestrial species. Mesic mountain tops surrounded by a dramatically different environment such as desert are sufficiently similar to use this analogy.

In this island analogy, the "continent" contains an inexhaustible supply of potential colonizer species. Immigration and colonization from the source pool of species are always possible, no matter how improbable. Mexican spotted owl habitat differs from the northern spotted owl, being naturally fragmented and often separated by large, unsuitable habitat areas. Mexican spotted owl population viability appears to closely resemble forces operating through the island archipelago model.

The basic concepts used in the report, widely accepted among specialists in the fields of ecology and conservation biology (Thomas *et al.* 1990), are as follows:

Species that are well-distributed across their range are less prone to extirpation than species confined to small portions of their range.

Distribution is the key hedge against major catastrophes that could otherwise extinguish the sole remaining population of a once widespread species.

Large blocks of habitat, containing multiple pairs of the species in question, are superior to small blocks of habitat with only one to a few pairs.

Blocks of habitat that are close together are better than blocks far apart.

Habitat that occurs in less fragmented (contiguous) blocks is better than habitat that is more fragmented.

Habitat between blocks function better to allow owls to move (disperse) through them the more nearly they resemble suitable habitat for the species in question. (Blocks that are well-connected in terms of habitat are better than blocks that are not).

These concepts are described more fully in Thomas *et al.* (1990). The ways proposed to reduce the risk of the above factors include:

Having interacting, relatively large, effective population sizes. Thomas proposed establishment of an array of habitat blocks containing multiple pairs of owls, well-distributed throughout the range of the northern spotted owl and spaced closely enough to facilitate dispersal of owls among them. They referred to these as Habitat Conservation Areas (HCA).

Distribute populations throughout the range.

Distribute HCAs within and among provinces for recolonization and lowering odds of a large-scale habitat loss.

Dispersion of HCAs to reduce risks of parasites and disease.

Blocking large habitat areas in HCAs to reduce risks from competitors and predators.

Assurance of habitat conditions needed to elude predators.

Close spacing of HCAs with intervening habitats for linkage.

Provision of high-quality habitat in HCAs large enough for 20+ pairs to provide a high probability of at least intermediate-range persistence.

Thomas *et al.* (1990) pointed out that once the strategy provides adequate habitat for pairs to have a reasonably high chance of long-term persistence, other elements may become more important than increasing total population size. These elements may include extent of geographic distribution, spacing of breeding units, and sufficient habitat to assure successful breeding. A successful strategy also requires assuring that dispersing juveniles have a high probability of locating and filling vacancies created by deceased territory holders. To do so will foster successful population dynamics, and assure that social interactions vital to a population's success, can take place. Once these elements are assured, all populations can have an excellent chance of persisting well into the future.

Without exception, empirical studies of the longevity of isolated populations show that those with fewer than two breeding pairs "wink out" (are subject to local extirpation) at an unacceptably high rate (Thomas *et al.* 1990). Thomas *et al.* (1990) stated that once stability is reached in the spotted owl habitat area (SOHA) network–then, when most other available habitat has been made unsuitable for spotted owls and the remaining population exists in units of one or two pairs–the rate of local extirpation will inevitably be too high to assure long-term persistence.

Empirical data and theoretical modeling indicate that habitat blocks with as few as 15 to 20 pairs have a relatively low probability of extirpation (Table 1). Thomas *et al.* (1990) believed this low probability of extirpation would hold for a system that includes many such habitat blocks separated by distances and connected by habitat features consistent with known dispersal tendencies and capabilities of the species. They concluded interconnected large

habitat blocks probably function more like a single, interacting population than as isolated subpopulations. Others have reached a similar conclusion, suggesting that the effective areas of habitat blocks are increased when birds can move between them with relative ease. It may be more appropriate to regard the entire "archipelago" of patches as the habitat block.

Table 1. Extirpation rate as a function of mean population size in large-bodied, nonmigrant birds (based on data in Pimm *et al.* 1988)

Number of Pairs	Number of Cases	Number Extirpations	Percent
<2)	42	32	76.2
2-5+	37	15	40.5
6-10+	9	2	22.2
11-15+	5	0	0.0
16	2	0	0.0

"Packing" is a phenomenon in which, for short periods, densities of individuals within undisturbed patches may increase. Packing of northern spotted owls was found to occur on Bureau of Land Management (BLM) lands in southern Oregon and Humboldt County, California. The phenomenon of packing underscores the need to assess population trends on as large a geographic scale as possible (Ibid.).

Habitat refugia can determine long-term persistence of animal populations. A small percentage of the habitat may, at times, provide the only refuge for the species and hence be absolutely essential to persistence of the species. There may be a threshold phenomenon, in which spotted owls may be able to survive and reproduce at apparently safe rates up to some threshold on total area of suitable habitat, mean distance between patches, or both.

Local extirpation or loss of species from parks, preserves, and habitat islands affects small populations and highly specialized, topographic-level species, such as raptors, more than other species (Thomas *et al.* 1990).

Thomas *et al.* (1990) found that clusters of at least 20 northern spotted owl pair sites were needed for stability where HCAs would not be contiguous habitat. Clusters of 15 sites appeared stable if all sites were initially suitable, at least moderate connectivity existed among clusters, and dispersing owls searched preferentially within their natal cluster. Individual owls that were members of a large cluster population become less susceptible to the uncertainties of between-cluster dispersal and the character of the landscape matrix. They suggested that a conservation network that provides only for individual pairs or small clusters of pairs has little likelihood of providing for continued existence of the species. Even relatively large HCAs had an uncertain fate if they were currently below their eventual carrying capabilities. In an individual-territory model, the probabilities of finding a suitable site or an individual of the opposite sex became insurmountable when suitable habitat was

less than about 20 percent of the landscape or when the population was too low. Clusters of five went slowly to extirpation. Very large HCAs may lead to a decline in genetic variation; therefore, some optimal (unknown) size for an HCA probably exists.

Thomas *et al.* (1990) found that for the northern spotted owl some physiographic provinces do not have habitat currently available to meet the theoretically desired conditions, due to timber management activities, land ownership patterns, recent disturbances such as wildfire and land capability. These were identified as areas of concern. For some areas, they had no choice but to designate HCAs that may support only a few pairs.

Thomas *et al.* (1990) concluded that the combination of low pair densities, low total number of pairs, low numbers of recruits and dispersing owls, and the resulting low dispersal success results in a substantially higher risk that the HCAs will not be occupied over the long term. Such problem areas have, at best, a low to moderate likelihood of continued existence beyond four or five generations. Occupied sites in many such areas, if not supplied with additional new habitat and immigrants, would likely begin to wink out beyond that time.

Dispersal in animals is defined as the relatively permanent movement of individuals from one location to another. Usually, dispersal is the movement of juveniles from their natal area to a site where they eventually settle to breed. Much recent literature in conservation biology supports the concept of providing "corridors" of suitable habitat between population centers. However, evidence is scanty on exactly what kind of corridors each particular species requires (Ibid.).

The habitat conservation strategy proposed for the northern spotted owl did not depend on specific corridors for dispersal of the northern spotted owl, but on recommendations for managing the landscape to facilitate movement of owls between HCAs (Ibid.). They preferred an option in which a major portion of the landscape in the connecting zones is potential dispersal habitat for the northern spotted owl. Standards and guidelines specified that at least 50 percent of the forest matrix outside of HCAs be maintained in forest stands with a mean diameter-breast-height (DBH) of 11 inches or greater, with at least 40 percent canopy. They also specified the retention of at least 80 acres of suitable northern spotted owl habitat within 1/4 mile of pairs not included in HCAs, up to seven 80-acre areas per township.

Thomas *et al.* (1990) found that a system of HCAs has at least three dispersal advantages over one-pair habitat areas, SOHAs. First, it provides for turnover events based on internal recruitment and dispersal within each HCA (related to the point on floaters, below). We already know that this phenomenon occurs in relatively large, continuous populations of spotted owls (Thomas *et al.* 1990). Second, it enhances dispersal from another locality. Furthermore, some purposeful arrangement of HCAs can be implemented to increase the likelihood of a dispersing bird encountering it, such as arranging oblong HCAs with their long dimension extending a substantial distance east-to-west or north-to-south. Third, if spotted owls tend to vocalize more frequently when in relatively dense populations than when isolated from other pairs and if dispersing birds respond to calls of other owls to

help guide them to suitable habitat, HCAs are more likely than isolated SOHAs to attract dispersers.

Little difference appeared in numbers protected over the short term. However, in the long term, the HCA system provides for significantly greater pair numbers. Of perhaps greater significance, the HCA system provides for a greatly increased likelihood of persistence.

Catastrophes come in different sizes. Examples include local to widespread droughts, small fires to major conflagrations, localized high winds to extensive and powerful storms, and so on. HCAs offer some cushion against smaller, more localized catastrophes. Small fires, for example, could easily destroy an entire SOHA or reduce the amount of suitable habitat in them to a point at which they could no longer support a breeding pair of owls. Small fires have relatively little impact on an HCA of many square miles. We further believe that SOHAs, as presently configured with multiple patches of relatively small stands of forest, are particularly vulnerable to windstorms.

Thomas *et al.* (1990) concluded that more northern spotted owl pairs will be protected in proposed HCAs in the short term than the number at the time believed to be protected by SOHAs, and many more will be protected by HCAs in the long term. On balance, the potential negative impacts of losing owls in areas between HCAs are most likely outweighed, by at least one order of magnitude, by the increased stability of populations within the HCAs.

If a major catastrophic event should destroy an entire HCA, more pairs of owls would be lost than if the area had contained only widely dispersed SOHAs (Thomas *et al.* 1990) However, in either case, the event would create a worrisome increase in distance that owls would need to cross when dispersing through the area. We believe this disadvantage is more acute with SOHAs than with a system of larger HCAs. Again, the major advantage of having relatively stable breeding units in HCAs, in contrast to the highly extirpation-prone SOHAs, far outweighs any potential advantage that SOHAs may offer in the event of a major catastrophe. Furthermore, as explained previously, SOHAs are much more vulnerable than large HCAs to complete destruction by smaller catastrophes at smaller geographic scales, which occur much more often than major ones.

Both empirical evidence and common sense suggest that not all available habitat is equal, either in quality or importance to the persistence of populations. Certain portions of habitat may provide sparse resources or resources may be available only during certain periods. Such habitat might be viewed as marginal in value to population persistence. By contrast, other habitat may provide a full range of resources that are constantly available through time. Such habitat not only may be suitable, but may also provide a refuge for individuals during environmental extremes when less suitable habitat areas may fail. Habitat refugia are particularly important to the persistence of species in regions where environmental extremes are commonplace.

Habitat of marginal quality, such as locations with few food sources or nest sites, may support a given species only under certain circumstances. For example, marginal habitats that are

normally empty may serve as the only refugia for plants and animals during times of fire, drought, or other environmental extremes. Under favorable conditions, marginal habitat may also boost the carrying capacity of an area. The resulting population's expansion can buffer the population against future periods of environmental stress. Populations of the bay checkerspot butterfly are a classic example (Thomas *et al.* 1990). Checkerspot populations live mostly on mesic, north-facing, grassland slopes. However, years of above-average rainfall allow the butterfly to expand its range into more xeric, south-facing slopes. Although infrequent and short-term, such expansions can contribute to long-term population persistence, especially for species whose numbers are usually regulated by environmental factors rather than by competition with other members of the same species.

Habitat fragmentation functions as either a partial or total barrier to dispersal for species associated with the original habitat. It is important to distinguish between fragmentation that isolates pairs and populations and fragmentation within the home range of individual pairs. The extent to which fragmentation within a home range is harmful is less well-known (Thomas *et al.* 1990). Fragmentation of homogeneous forest tracts tends to be accompanied by lowered northern spotted owl densities. However, much of the fragmentation between pairs and populations in the Mexican spotted owl range is due to natural habitat conditions, rather than induced.

Thomas *et al.* (1990) reported that individual northern spotted owls increase their home range size in response to fragmentation. However, as demonstrated by the presence of breeding owls in fragmented BLM lands in western Oregon, northern spotted owls can sustain some fragmentation within their home ranges. The effects of habitat fragmentation on the persistence of the northern spotted owl may be partially reduced by a habitat conservation strategy that attempts to provide the owl with habitat distributed across the landscape in a fashion most similar to its historical configuration. Studies of other species have suggested that a plan that incorporates three key considerations will have a substantial likelihood of success. These considerations include providing multiple, extensive, and continuous areas of superior and suitable habitat; distributing these areas across the landscape at distances that encourage demographic interaction among them; and providing adequate connectivity in the form of surrounding landscape features to facilitate that demographic interaction.

Unoccupied habitat presents itself in two forms: as vacant habitat of marginal quality, contiguous with or adjacent to occupied habitat; and as distinct, separate, empty patches of high- or low-quality habitat. Unoccupied patches of either marginal or high-quality habitat can serve as occasional stepping stones for regional populations. These patches can facilitate gene flow between small populations and can provide routes for individuals to colonize surrounding habitats in which the species once occurred but is now gone. The loss of "stepping stone" habitat patches can even disrupt the dynamics of entire regional populations. For example, the once widespread and abundant Karner blue butterfly of the "pine bush" regions of New York and surrounding states disappeared from many regions as a result of the fragmentation and isolation of occupied and unoccupied habitat patches and elimination of dispersal corridors.

Thomas *et al.* (1990)'s conclusions on the applicability of their recommendations to the Mexican spotted owl are as follows:

> "We can draw only limited inferences from the spotted owl situation in the Southwest. First, we lack good data on population sizes and the distances between populations. Second, the spotted owl in Arizona and New Mexico is a different subspecies that has evolved in a different milieu from that in the conifer forests of the Pacific Northwest. The dispersal behavior of the northern spotted owl evolved over millenia in relatively continuous expanses of conifer forest. The Mexican spotted owl evolved in a landscape containing massive visual cues to the locations of suitable habitat–mountain tops. But at least this case shows that one subspecies of spotted owls can maintain relative small subpopulations in isolated mountain ranges, probably through rescue effects from larger populations many miles distant."

Thomas *et al.* (1990) quoted from a letter of February 14, 1990, where Ganey stated: "Many populations of spotted owls in Arizona and New Mexico occur in relatively isolated mountain ranges, sometimes separated by wide expanses of Sonoran desert or other nonforested lands . . . . The distributional pattern of spotted owls in southern Arizona remains incompletely known, the extent of suitable habitat per mountain island is unknown, and densities in different islands of habitat are unknown. What is clear about this region is that spotted owls are widely distributed throughout these mountain islands. Some . . . are large, appear to contain lots of suitable habitat, and probably support populations of greater than 30 pairs each. Others . . . are relatively small, and probably support only a few pairs. It is hard to envision stable, self-supporting populations in some of the smaller ranges. Therefore, I believe that dispersal must occur between these islands, although this has not been documented . . . Spotted owls may also find the lowlands between islands less hostile than I once thought. In recent years . . . [we have obtained] a number of verified occurrences of owls in these lowlands between November and April."

The conditions affecting viability as identified by Thomas *et al.* (1990) were considered. There is little data to quantify these parameters but our present opinion will be provided for purposes of information.

Environmental variation–which results in low survival and reproductive rates–such as fluctuations in prey densities or periods of harsh weather. "The pair occupancy data from formal monitoring sites and information provided by Johnson and Johnson (1990), as well as biotic community information, all point towards the northern part of the range as exhibiting environmental variation. This concern contributed to our view that complexes in the northern portion of the range and especially the Santa Fe National Forest needed additional scrutiny."

Environmental catastrophes–which result in direct habitat loss, population reduction, or isolation–such as wildfire, windstorms, and volcanoes.

Local increases in other species, especially predators, competitors, parasites, and disease.

Systematic habitat loss–such as the widespread, rapid conversion of old forests to young forests–by natural occurrences and human activities.

Forest stand fragmentation–of owl habitat at both local or regional scales.

Connectivity loss, resulting in uneven distribution of spotted owl habitat across physiographic provinces.

Thomas *et al.* (1990) addressed dispersal between HCAs and across the intervening landscape with the 50-11-40 rule. We have examined this concept and considered the zone from Flagstaff, south and east along the Mogollon Rim to the Black Range as an area that may parallel the relatively contiguous forest landscape potential of the mountain ranges that the northern spotted owl occupied in the Pacific Northwest. We believe that this 50-11-40 concept applied as 50-9-40 (Fletcher, pers. comm.) would be an essential element of a conservation strategy in this zone, which we think is similar to landscape potentials that Thomas *et al.* (1990) considered. Portions of the northern New Mexico were considered for their potential as a similar landform that would need a 50-9-40 measure applied. After review of actions in relation to the residual amount of habitat for dispersal, it was not believed to be necessary for FY 1992 actions.

Random variation in survival and fecundity among individuals within small, isolated populations

Loss of genetic variation or length of time in a genetic bottleneck, resulting in reduced fecundity and adaptability, and increased mortality rates, especially in small, isolated populations.

CURRENT SITUATION

Overview of the Region

The subspecies' distribution is described in the Mexican Spotted Owl Status Review: (USFWS 1991) as follows:

> "Its range extends from the southern Rocky Mountains in Colorado and the Colorado Plateau in southern Utah, southward through Arizona and New Mexico and, discontinuously, through the Sierra Madre Occidental and Oriental to the mountains at the southern end of the Mexican Plateau."

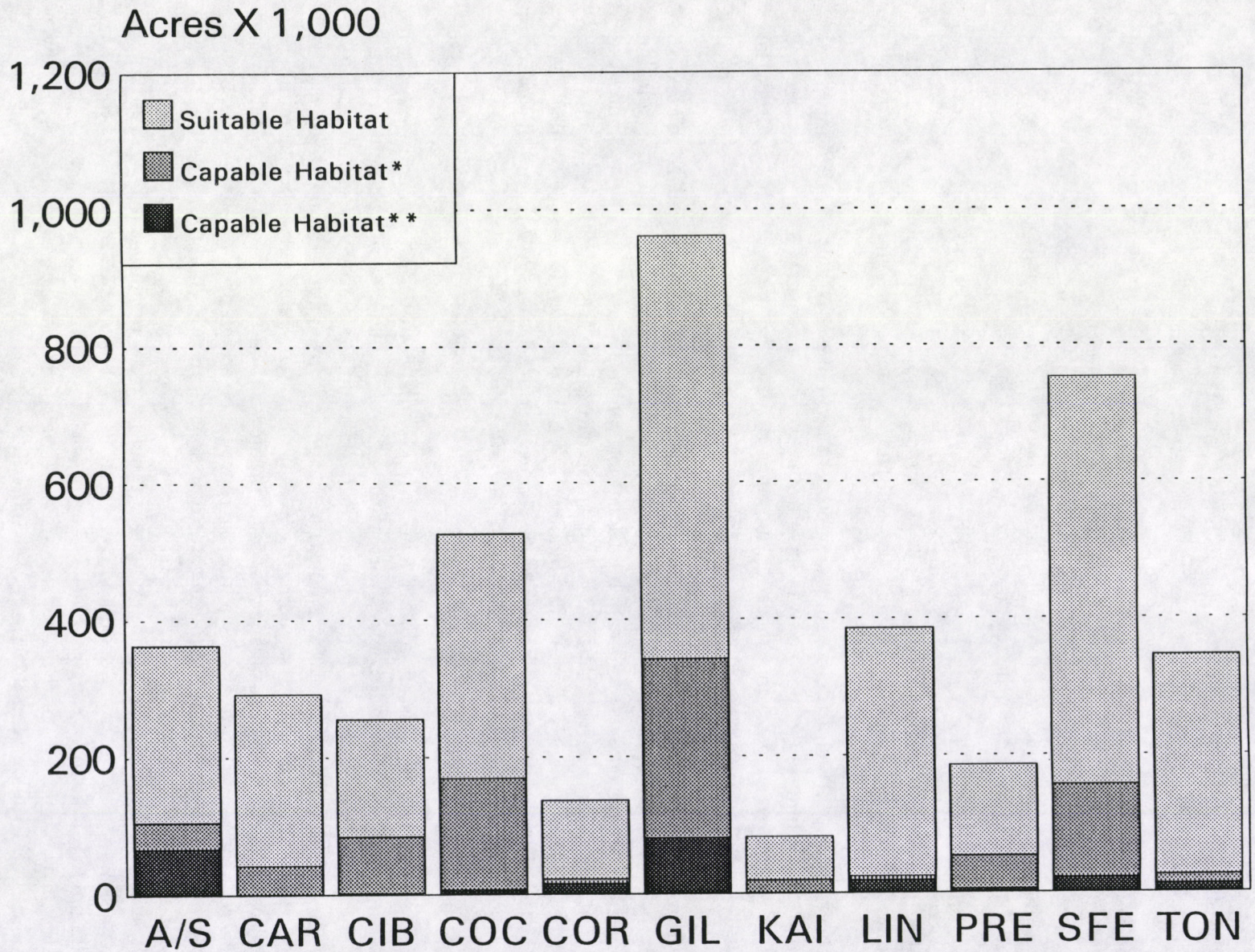
The states of Utah, Colorado, Arizona, New Mexico, and northern portions of Sonora and Chihuahua, Mexico, represent the northern half of the subspecies' range.

The northernmost portion of the range having current owl records is southern Colorado and southern Utah. While single spotted owls have been recorded in several locations, there are currently two confirmed pairs in Colorado and eight in Utah (USFWS 1991). This is the northernmost limit of the owl's range.

The Southwestern Region of the Forest Service, which includes Arizona and New Mexico, is relatively central to the northern half of the subspecies' range. The amount of suitable (meets Regional requirements) and capable (does not currently meet but has the potential to meet suitable characteristics) habitat found on Southwestern Region Forests is shown in Figure 4. The management status of suitable habitat lands is shown in Figure 5. The FWS estimated that the Southwestern Region of the Forest Service had 882 MTs and 564 pairs. Considering all land ownerships in Arizona and New Mexico, the FWS estimates were 1,253 MTs and 794 pairs (FWS 1991).

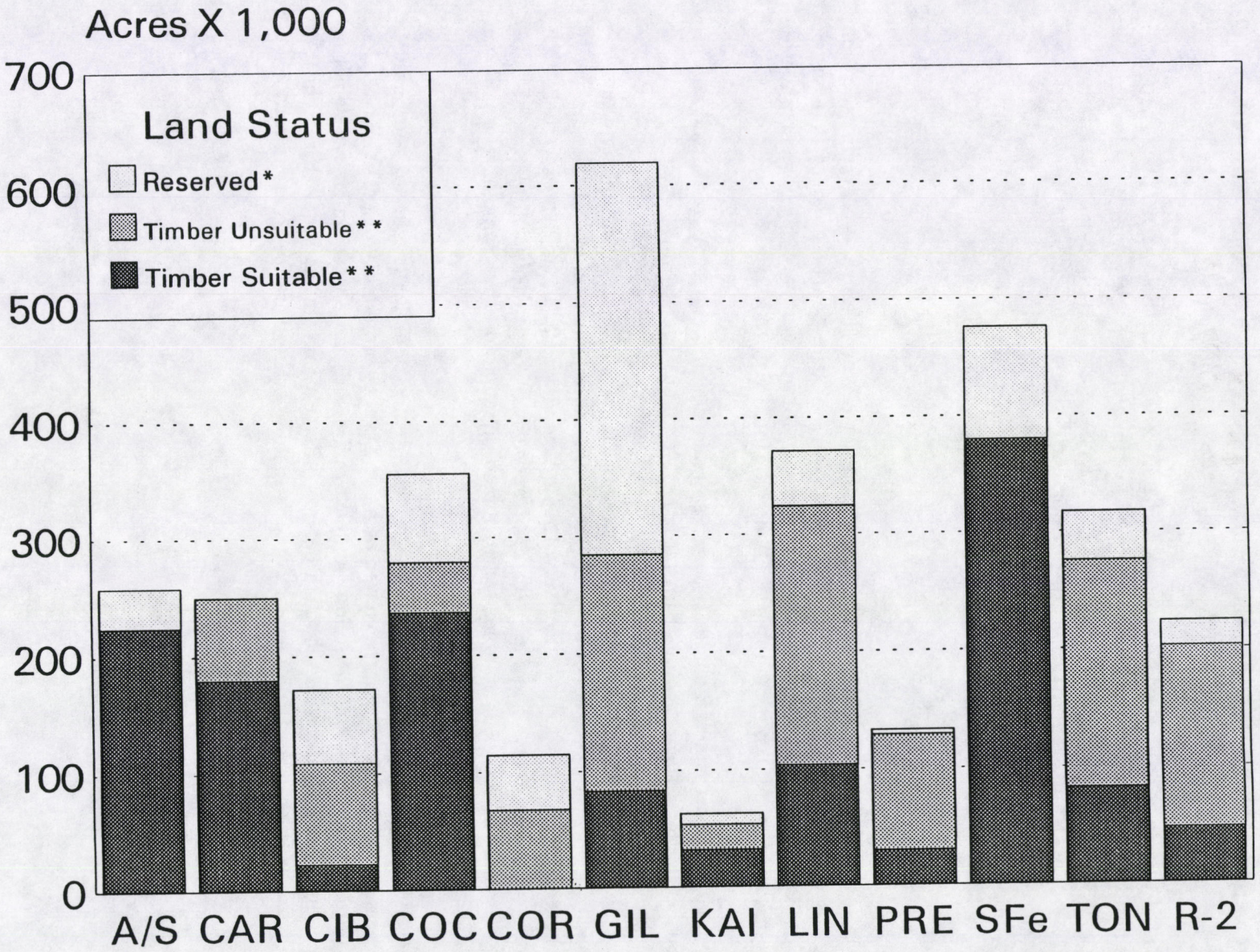
The Southwestern Region is essential for maintaining owl distribution in Utah and Colorado. If the statement in the Status Review is correct that "Even in the area of apparent greatest density, in northeastern Sonora and northwestern Chihuahua, the species is uncommon," then the Region is essential to maintaining the subspecies throughout the northern half of the range. The remainder of the range in Mexico may or may not contain sufficient numbers and habitat for survival of the subspecies. It is unknown if or how Mexican spotted owls interact across the range; however, we believe there would be a high probability of extirpation without the Regional matrix and adjacent states of Sonora and Chihuahua.

Within the Southwestern Region many mountain ranges are discontinuous and separated by desert, grassland, and coniferous woodland communities. The owl's present range is thought to be similar to its historic range (Ibid.). Present distribution shows a pattern of sparse occupation in the northern portion of the range, while mountain ranges in southern New Mexico and the Mogollon Rim in Arizona are more densely



* Man caused modifications (i.e. timber sales); ** Habitat modified by natural causes (i.e. fires)

Figure 4. Suitable and Capable Mexican spotted owl Habitat on National Forest Land, Southwestern Region.



*Wilderness etc.; **Land suitable or unsuitable for timber harvest based on Forest plans.

Figure 5. Land Status of Mexican spotted owl Habitat on National Forest Land, Southwestern Region.

populated (Figure 6). The spatial array of mountain ranges and habitats for the Mexican spotted owl lends itself to being viewed under an archipelago concept as a whole, as described by Harris (1984, 1988). There is only one portion of the landscape, along the Mogollon Rim in Arizona and Mogollon Mountains of New Mexico, which is relatively contiguous and may be viewed as similar to landscape assessed for the northern spotted owl. This area might be seen as a large island central to the natural archipelago of owl habitat in the Regional landscape. It is likely an essential area for maintaining viability of the owl.

We divided the Region into two portions; a Northern Zone and a Southern Zone (Figure 6). This is similar to subregions of northern New Mexico, southern New Mexico, and Arizona used in portions of the Status Review, 1991. We considered Kaibab National Forest in Arizona as biologically similar to portions of northern New Mexico and have included it as part of the Northern Zone. The Southern Zone includes an area similar to the southern New Mexico subregion and all national forests in Arizona except Kaibab National Forest.

Southern Zone

Habitats and subpopulations delineated as the Southern Zone (Figure 6) are believed to be relatively secure. There are a total of 571 owl MTs, in the Southern Zone; (Coconino, Coronado, Gila, Prescott, Tonto, Lincoln, and Apache-Sitgreaves National Forests, and the Magdalena and San Mateo Mountains of Cibola National Forest).

The Mogollon Rim complex includes the area starting near Flagstaff, Arizona, and continuing southeast along the Mogollon Rim into the Mogollon, Black Range, San Mateo and Magdalena Mountain ranges of New Mexico. It appears to be a contiguous subpopulation central to Mexican spotted owl distribution as they occur nearly continously along the Mogollon Rim on FS lands. This Complex (Figure 6), contains known owl MTs in relatively dense aggregations (Figure 7). Collectively, this area is viewed as having an extremely high probability of persistence. The mean distance between HMAs in this complex, mean distance to the nearest adjacent complex, and average distance to other complexes are shown in Table 2.

The Sacramento Mountains form the Southern New Mexico Complex (Figure 6) and because of dense congregations are similarly viewed as having a high probability of persistence. This area is more isolated than the Mogollon Complex but is similar in having high owl densities and reproductive rates. Average distance between the two Lincoln National Forest clusters in this complex, distance to the nearest complex, and average distance to other complexes are shown in Table 2.

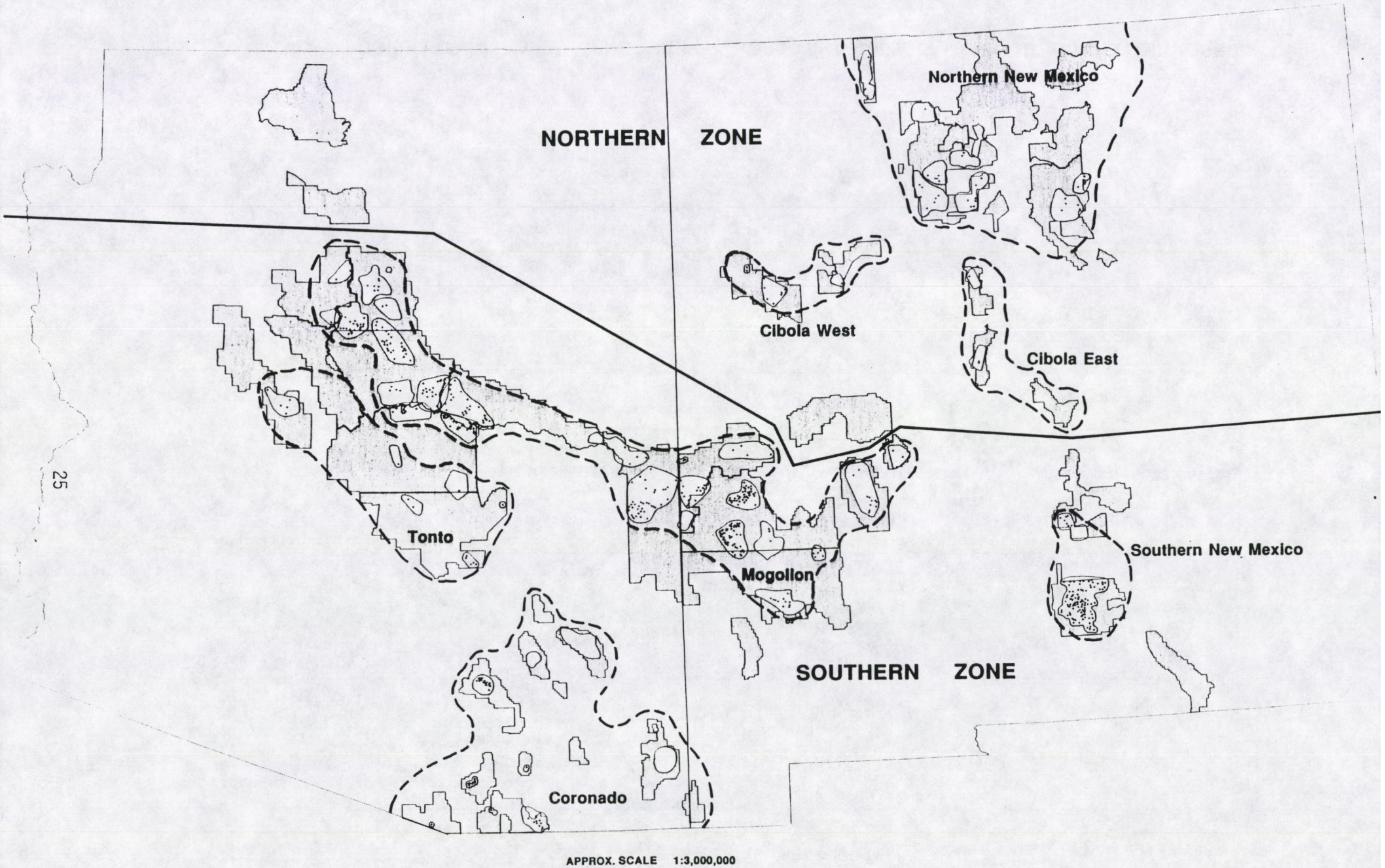


Figure 6. Mexican spotted owl Habitat Complexes and Northern and Southern Zones, Southwestern Region.

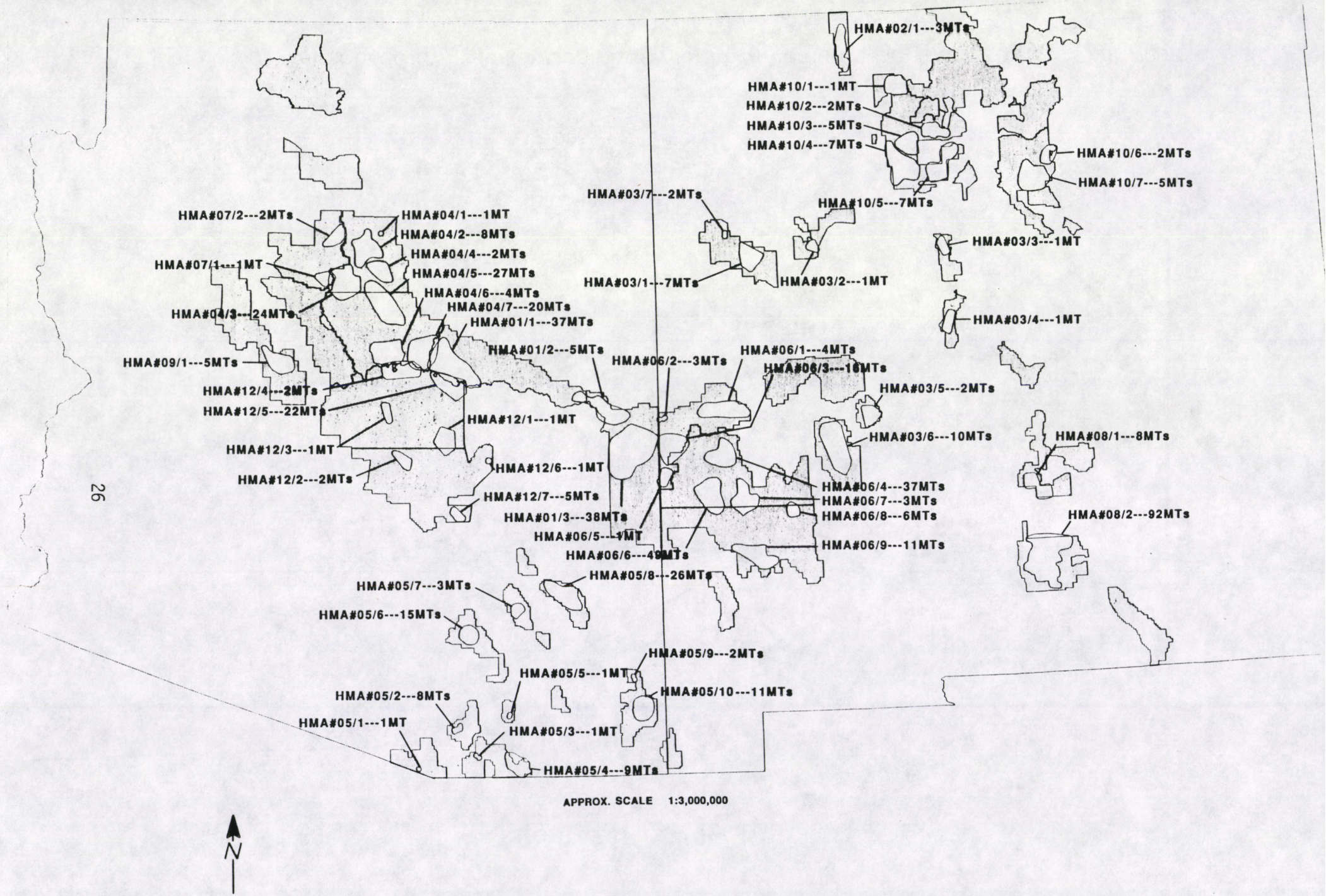


Figure 7. Mexican spotted owl Habitat Management Areas with Number of Management Territories.

Table 2. Mean distance between HMAs within a complex, mean distance to nearest complex and mean distance to proximate complexes stratified by geographic areas.

Complex	Distance (Mi) Between HMAs w/in Complex	Distance (Mi) to Nearest Complex	Mean Distance (Mi) to Other Complexes
Southwestern Region	35.0	-	-
Northern Zone	36.6	72.9	-
Southern Zone	30.0	30.4	-
Mogollon Complex	11.6	36.2	71.4
Tonto Complex	26.6	36.2	45.8
Coronado Complex	29.7	51.8	67.1
Tonto-Coronado Complexes	28.8	55.0	-
Northern N.M. Complex	17.6	56.9	61.7
Southern N.M. Complex	18.2	66.8	87.6
Cibola East	36.0	38.3	56.4
Cibola West	15.1	66.0	74.3

The area south of the Mogollon Complex, called the Tonto Complex (Figure 6), is characterized by minor scattered owl occurrences below the Mogollon Rim; with several high-density aggregations of owls in the more southern, isolated mountain ranges. Portions of Coconino, Tonto, and Apache National Forests, as well as portions of White Mountain Apache Indian Reservation and San Carlos Indian Reservation, contain some owls in a scattered pattern of pair occurrences throughout.

We believe this portion of the range functions as many small subpopulations. Simultanous subpopulation extirpation is unlikely. The area south of the Mogollon Complex is expected to receive owls from other subpopulations, periodically benefiting from a "rescue" effect. We believe it reasonable to expect interaction with subpopulations to the north and south.

Prescott National Forest's portion of the Tonto Complex, the area west of the Verde River, is in a landscape matrix of discontinuous habitat. There is a cluster of 15 MTs a long distance from the next known owl occurrences. We do not know if this is a biological "island" because we lack inventory work in the intervening landscape. Inventory of these lands, under other

than FS management, is needed and no provision has been made for protecting spotted owls on these lands.

The Coronado Complex, located on Coronado National Forest, is characterized by scattered mountain ranges with intervening Sonoran Desert. The Pinaleno Mountain range has 26 MTs; exceeding the recommended 20-pair size Thomas *et al.* (1990) felt was the minimum size needed to persist for 100 years. Average distances between HMAs in this complex and minimum and average distances to other complexes are shown in Table 2.

The Chihuahua Mountains have 13 MTs, with about one-third of the area inventoried. This subpopulation is expected to have at least 20 pairs. There are nine MTs in the Huachuca Mountains and owls occurr on Fort Huachuca Military Reservation lands-although the total number is unknown. Owls on this military reservation are contiguous with adjacent owls on FS land in the Huachuca Mountains and provide a higher probability of persistence through time than would the nine known MTs.

The Santa Rita Mountains contain eight known MTs. All of these subpopulations have a moderate probability of persistence. The remaining mountain ranges have extremely low numbers of known pairs.

The Coronado Complex has 8-20+ pairs distributed over the area. Owls in these isolated ranges may interact and rescue effect may occur. Collectively, the area is expected to have a moderate degree of persistence. High-risk areas contain fewer than eight pairs. We believe it reasonable to expect interaction with owls to the north on Tonto National Forest or San Carlos Apache Indian Reservation.

Northern Zone

Information suggests that the Northern Zone (Figure 6) is less suitable for breeding owls than the Southern Zone. It has an array of widely dispersed, scattered owls, with lower pair densities and lower reproductive success. There are 49 known MTs in this area. Large areas in between lack owls and appear likely to be dispersal or movement corridors. This array of owl occurrences and habitat constitutes slightly over 30 percent of the subspecies' distribution in the Region.

The forested portions of Kaibab National Forest provide dispersal habitat, rather than being suitable for reproduction. The North Kaibab has large areas of apparently suitable habitat; however, there are no owls. Snow depth and a lack of available prey (due to the snow depth) may account for the disparity between what we perceive as suitable habitat and whatis actually suitable to the owls.

While the actual reasons for the lack of owls on the Kaibab is unknown, we do not believe it is due to movement barriers. Historic records of owl sightings in the Grand Canyon suggest to us that occasional owl movement into the Kaibab occurs from other areas, such as from Coconino subpopulations to the south.

This same disparity between mapped and actual suitable habitat may also occur on portions of the Santa Fe and most of the Carson National Forest in New Mexico, (Northern New Mexico Complex; Figure 6). The complex is characterized by widely separated aggregations of a few owls each. This area particularly concerns us at this time.

In the Northern New Mexico Complex, the Jemez Mountain Range, Southeast portion of the Sangre de Cristos and the Zuni and Mount Taylor ranges form the known subpopulation areas with a short-term potential for having an aggregation of 20 or more owls. This complex appears fragile.

The Zuni Mountains and Mount Taylor provide the only linkage of owls over a 145-mile distance (Figure 8) between the Northern New Mexico Complex and the Mogollon Complex. The Zuni Mountains have 10 owl MTs and Mount Taylor has one. Future inventories should find more owls.

Owls on lands of other ownership may contribute to this complex; however, we have no information for these other ownerships. We believe that the entire Northern New Mexico Complex is collectively functioning to maintain this portion of the subspecies distribution. Owls on lands other than in the Zuni Mountains may be adversely affected by timber harvest occurring adjacent to Cibola National Forest lands. Additional owls may occur on Mount Taylor are predominantly on lands not under Forest Service administration. The lack of data for these adjacent ownerships and the low owl numbers on National Forest lands are of concern. The present density of owls on all ownerships in the area and interaction with other subpopulations may be sufficient to retain this portion of the subpopulation. Until more is known and protection is provided to owls on other ownerships, we believe it is prudent for a viability assessment to rely on expected numbers on Forest Service-administered lands. We consider this subpopulation at risk with a high probability of experiencing periodic extirpation.

The Gallina, Manzano, and Sandia Mountains of Cibola National Forest are likely key habitat that facilitates successful movement between other subpopulations to the north and south. There are no known owls in the Gallinas, two known in the Manzanos, and one known in the Sandias. Breeding habitat in these ranges is viewed as extremely important based on what is currently known. Limited breeding habitat exists in sufficient amounts to support a subpopulation. This area has a high risk of localized periodic extirpations. At the same time, it is likely to be a key linkage and vital to the health of the larger Regional matrix of owl habitat. The portion of this complex in the Jemez and Sangre de Cristo Mountains, Santa Fe National Forest, represents the northern most aggregation of known occurrences with the potential to function as subpopulations. These are connected to subpopulations in the Southern Zone only through the linkage described above. Owls in the Jemez Mountains, could function as a subpopulation with a high probability of persistence. The fact that these aggregations are not densely packed suggests they are smaller aggregations. The Jemez owls are critical to supporting owl occurrences in adjacent portions of the Range.

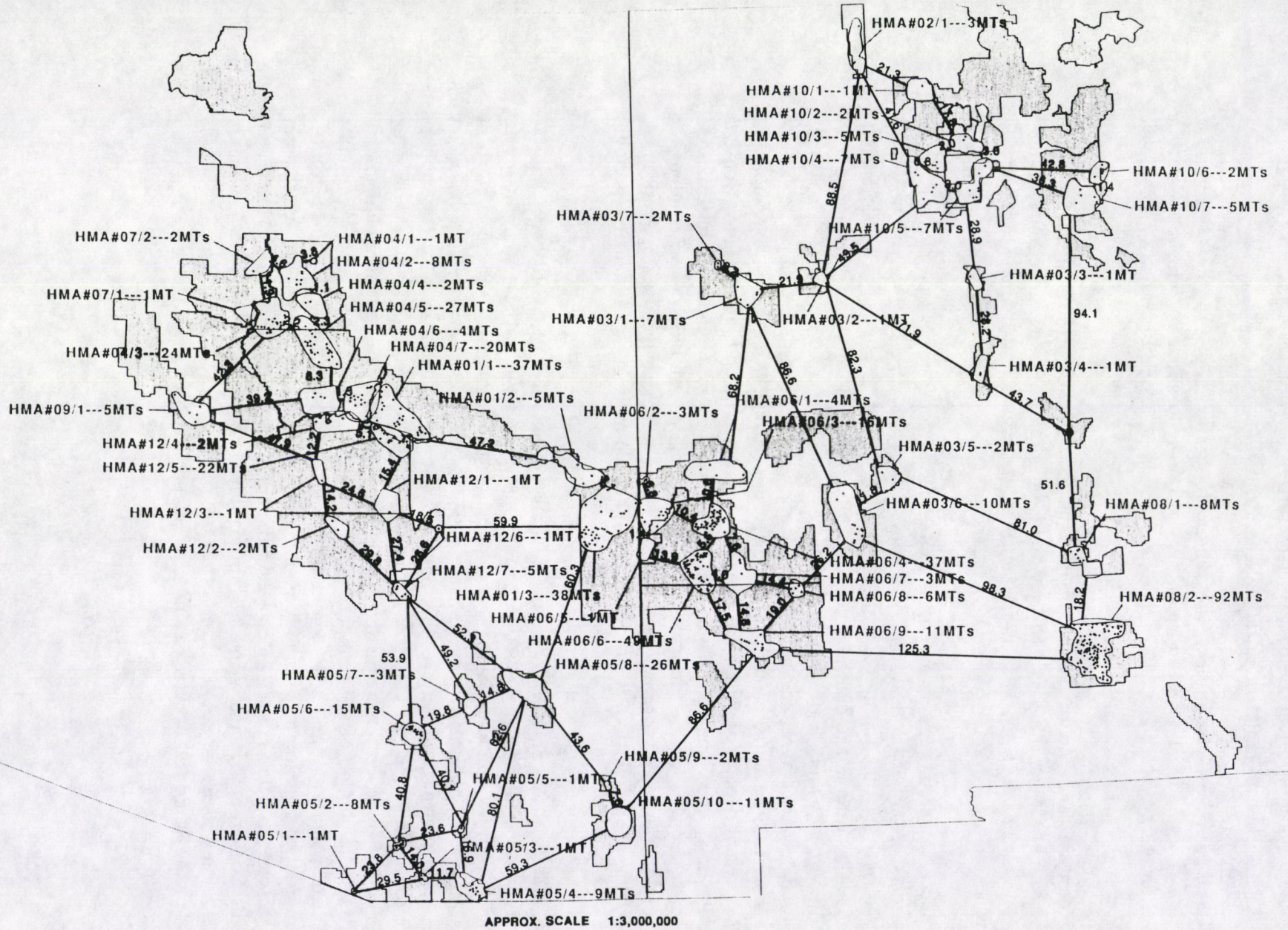


Figure 8. Distances in Miles Between Habitat Management Areas.

Monitoring information suggests that the Jemez area may have lower reproduction capability than southern areas and may be a stable or declining subpopulation. Until information indicates higher than currently indicated reproduction rates, this area remains a concern.

The Sangre de Cristo owls are clustered loosely in the southeast portion of the mountain range may function to provide a reasonable probability of persistence. This subpopulation is of concern. We view it as having a high probability of periodic extirpation.

The Jicarilla Mountains of Carson National Forest has three owl MTs established. The probability of more owls is low because of limited suitable canyon habitat. It is reasonable to expect that other owls inhabit Jicarilla Indian Reservation lands, private lands, and possibly BLM-administered lands. This area may form an array of small owl clusters with very high individual probabilities for periodic extirpation but collectively provide a more persistent extension of the species distribution. The area is viewed as a key linkage to Utah and Colorado occurrences that delineate the extreme margin of the species range.

We view the delineated habitat of Carson National Forest in the San Juan and Sangre de Cristo Mountain Ranges as dispersal habitat having relatively large areas of suitable habitat; there are no known breeding owls. Similar to Kaibab National Forest, a disparity between mapped suitable habitat and habitat that is actually suitable exists. We view both areas as dispersal habitat or being biological "sinks" lacking potential to sustain populations of their own.

A detailed discussion of the current situation, by Forest, is found in Appendix A.

PROPOSED ACTIONS

Types of Actions

Timber actions include: 1) *Intermediate cuts*, are typically used to thin dense stands of trees to allow residual trees room to grow. Trees removed are usually deformed, suppressed, or diseased. Commercial species basal areas (BA) are generally reduced down to 80-90 square feet per acre for this treatment and trees are spaced somewhat evenly across the stand. A variety of diameter classes can be thinned but this treatment usually occurs during the early and mid-seral stages of the stand. 2) *Sanitation cuts*, occur in stands where trees are infected with dwarf mistletoe. Infected pine trees may occur individually or in groups in a variety of age classes across the stand. Treated stands will appear as scattered openings (.5-5 acres.), scattered trees, clumps of trees, or thinned with a variety of diameter and age classes remaining. Basal areas will vary throughout the stand but should average 50 square feet of pine per acre. 3) *Final removal cuts*, typically occur in mature stands of commercial sawtimber with seedlings/saplings (regeneration) in the understory. The mature trees are removed to allow seedlings to grow. Basal areas may be high after treatment if numerous seedlings/saplings are present. Diameter classes will be low, usually less than 2 inches DBH. 4) *Shelterwood and seedtree cuts*, occur in mature stands being prepared for regeneration. The majority of mature trees are removed, resembling a heavy thinning. Remaining trees are spaced evenly to allow seeds to fall and begin regeneration. Residual pine trees are generally greater than 12 inches DBH and the basal area is reduced to 40-50 square feet per acre. 5) *Clear cuts*, typically occur in mature stands of commercial sawtimber. All commercial and noncommercial species are generally removed from the stand. The area is regenerated by planting desired species.
6) *Precommercial thinning*, occuring in dense stands of saplings less than 5 inches DBH, is where some saplings are removed to reduce competition for water and nutrients. The remaining trees are spaced 10-15 feet apart. Other species, like juniper, may also be removed to reduce competition. Cut trees are usually left scattered over the area. This treatment may be applied in areas previously treated with final removal cuts.

Timber harvest activities use rubber tire skidders to transport trees/logs to landings sometime damaging understory vegetation. Generally, logging slash and debris are scattered and piled on the site.

Controlled burning in conifer is generally used to reduce fuel buildup, increase quality and quantity of forage, or prepare seedbeds for regeneration. Generally, low-intensity burns performed in fall or winter. Usually, trees larger than 2 inches DBH are not killed. Understory species are removed with some species resprouting after the burn. The overstory structure and composition are not changed with this type of controlled burn.

Road reconstruction will occur in a variety of conifer diameter classes.

Proposed Activities

Some 128 harvest activities proposed for the Southwestern Region (Table 3), will harvest about 238 million board feet of timber over 91,300 acres. Of this acreage, where modifications to the existing stand structure will occur, just over 14,900 (16 percent) will occur in owl habitat.

Activities were categorized based on expected level of impact. Projects affecting 0-10 acres of suitable habitat are Category 1 projects, those affecting 10-250 acres of suitable habitat are Category 2 projects and those affecting more than 250 acres of suitable habitat are Category 3. Nearly half modify no more than 10 acres of suitable Mexican spotted owl habitat (Category 1). Sixty-one Category 1 activities modify a total of only 33 acres of suitable owl habitat even though almost 54,000 acres (55 percent of total acreage treated) of forested areas will be treated.

Nearly half (42 percent) of the volume proposed for harvest would come from the 31 Catergory 3 activities. This harvest volume is proposed to come from slightly over 29,000 acres, or 32 percent of the total acreage. Forty percent is in owl habitat. These sales make up 89 percent of all acres of owl habitat proposed for modification this year.

Thirty one projects harvesting between 10 and 250 acres of suitable habitat (Category 2) make up the remaining 21 percent of owl habitat proposed for modification. The Category 2 sales harvest the remaining 10 percent of the owl habitat to be modified this year.

Of the 3.365 million acres of suitable owl habitat in the Region, the amount to be harvested in 1992 amounts to just over 0.4 percent. Some stands proposed for treatment would still exceed 60- to 70-percent canopy closure after treatment with trees greater than 14-16 inches in diameter. The effects of the activities in suitable habitat will be lower than suggested by Table 3.

All actions will meet standards of ID No. 2 and have individual biological evaluations and NEPA documentation

Table 3. Summary of Region 3 proposed 1992 actions. Category; number of activities; habitat type; acres modified; volume harvested; acres MSO; acres HCC (clearcut); acres HSH (shelterwood); acres HST (seedtree); acres HIT (intermediate treatment); acres HSS (sanitation/salvage); acres HFR (final removal) for projects in Region 3.

CATEGORY NUMBER	NUMBER OF ACTIVITIES	HABITAT TYPE	ACRES MODIFIED	VOLUME HARVESTED	ACRES MSO	ACRES HCC	ACRES HSH	ACRES HST	ACRES HIT	ACRES HSS	ACRES HFR
1	30	PP	30,801	73,524	0	27	880	105	1,224	1,829	231
	8	PP/MC	2,720	3,770	0	3	0	0	0	0	0
	1	PP/PO	4,809	15,600	0	0	0	0	0	0	0
	1	PP/PO/PJ	300	400	0	0	0	0	0	0	0
	7	MC	2,078	9,905	10	1	0	0	0	0	0
	1	PO	0	0	0	0	0	0	121	120	0
	1	MC/PO	NA	NA	0	0	0	0	0	0	0
	16	NA	21,281	24,709	23	1	0	0	0	0	0
Total	61		53,889	116,908	33	32	880	105	1,345	1,949	231
2	13	PP	2,522	5,896	283	09	84	0	498	125	10
	6	PP/MC	745	1,170	1,676	30	47	0	601	75	92
	1	PP/PO	204	282	204	0	0	0	204	0	0
	1	AS	25	0	0	25	0	0	0	0	0
	6	MC	127	991	127	0	0	0	50	76	61
	3	MC/PP	1,990	9,825	400	25	108	0	238	90	0
	4	NA	2,361	2,241	447	0	0	0	0	0	0
Subtotal	31		7,974	20,405	3,137	80	239	0	1,591	366	163
3	8	PP	7,077	19,862	2,938	2	396	550	2,250	678	139
	4	PP/MC	3,400	9,000	3,479	79	1,174	43	1,131	1,532	106
	3	PP/PO	4,833	17,200	591	0	0	0	541	0	0
	7	MC	6,479	20,121	1,964	35	330	57	925	643	1,023
	4	MC/PP	3,212	15,695	1,789	0	1,905	0	514	39	0
	1	MC/PO	N/A	N/A	0	0	0	0	0	0	0
	2	PO	24,233	14,558	780	0	93	0	565	287	0
	1	SF/MC	N/A	N/A	0	0	0	0	0	0	0
	1	NA	1,171	4,632	222	0	0	0	0	0	0
Subtotal	31		29,455	101,068	11,813	116	3,898	650	5,926	3,179	1,268
Total	128		91,318	238,381	14,983	228	5,017	755	8,862	5,494	1,662

PROCESS

The lack of information concerning owl reproduction, survival, dispersal and other parameters precludes a quantitative population analysis at this time. An evaluation using only acres affected and known owls affected, was considered to be insufficient without taking into account spatial analysis. Examination of landforms and owl distribution suggest that island biogeographic theory (Harris 1984) is applicable to assessing the Regional landscape. The most current scientific information available, relating island biology theory to spotted owls, is the Interagency Scientific Committee Report for the Northern spotted owl (Thomas et al. 1990). We examined this work and applied basic concepts to assess owl distribution in the Region. This assessment provided the basis for our opinion of the subspecies security within the Region and served as a basis to judge spatial effects of 1992 actions.

We used a mapping process that overlaid owl MTs, suitable habitat, acres inventoried, proposed actions, and potential HMAs on maps to evaluate spatial activity patterns.

MTs provided the initial layer of information. Other (non-territorial) owl occurrences were also considered including 1) locations of owls predicted to occur on ownerships such as the White Mountain Apache or Mescalero Apache Indian Reservations and 2) historic observations of owls in areas of forested habitat. Areas that have no habitat potential (Sonoran Desert) but do have anecdotal dispersal information were also considered.

Analysis of the mapped HMA layer helped identify clusters of known MTs in the landscape. HMAs were assumed to have a high probability of interaction. The aggregation of HMAs into complexes or zones was delineated by considering landform, vegetation, owl occurrence, and judgment of how these areas share common form or function in a landscape view of the Region. Examination of biotic communities (Brown and Lowe 1980), ecoregions (Bailey 1976), potential natural vegetation (Kuchler, 1964), and terrestrial ecosystems (Forest Service 1992) were used in forming opinions about patterns of owl occurrence, habitat, and future expectations of persistence in a regional context.

The suitable habitat layer was used to analyze relative fragmentation at a HMA forest and complex scale. The biotic community mapping mentioned previously, provided insight into natural fragmentation at a landscape scale. Data available for the suitable habitat layer varied greatly by the degree of refinement each forest was able to provide.

The layer displaying inventoried areas served as a guide for considering what is known about owl occurrence and what additional owls may be expected to occur in uninventoried portions of the landscape.

Proposed 1992 actions were mapped to show each action's general location within the landscape. Detailed maps are located in the project record for each proposed action at the field level. The general location information was sufficient for our consideration of where actions were proposed in relation to MTs, HMAs, and expected owl occurrence in other areas.

Combining information layers allowed us to evaluate owl distribution and densities, habitat distribution, interconnectivity, and identify areas of concern.

Proposed projects were examined in relation to concerns about the portion of the Regional matrix in which they occurred, the amount of suitable habitat that would be changed in quality to capable habitat, and the occurrence of owls. All ongoing activities and those under contract were assumed completed for purposes of this analysis and the effects of those actions were considered.

Because the Northern New Mexico Complex was considered at risk, personnel from Santa Fe and Cibola National Forests were requested to meet with the Biological Evaluation Review Team to provide detailed information on owls, habitat, and projects.

DETERMINATION OF EFFECTS

Region-wide

Modification of suitable habitat, 0.4 percent of the 3.365 million acres, is expected as a result of the 1992 actions. This is not considered significant. Figure 9 represents an incremental change in the amount of suitable habitat over the last two years. Values are not additive but represent minor changes in total acreage by Forest. Forests which do not have change will have bars level all the way across. As a result of the 1992 actions an increase in capable habitat will result. Figure 10 shows the incremental change in capable habitat.

Northern Zone - Santa Fe and Cibola National Forests

Both density and reproduction of owls in this part of the range appear lower than in the Southern Zone. There are also lower total numbers, no clusters of 20 or more pairs, and weaker connections between the portions of this zone. No large, contiguous areas of suitable, occupied habitat exist. Due to these concerns, any present or future loss of spotted owls on the Santa Fe or Cibola National Forests would be of concern. The 1992 actions as proposed, on these two forests, could contribute to a loss of viability in this portion of the subspecies' range.

Northern Zone - Carson and Kaibab National Forests

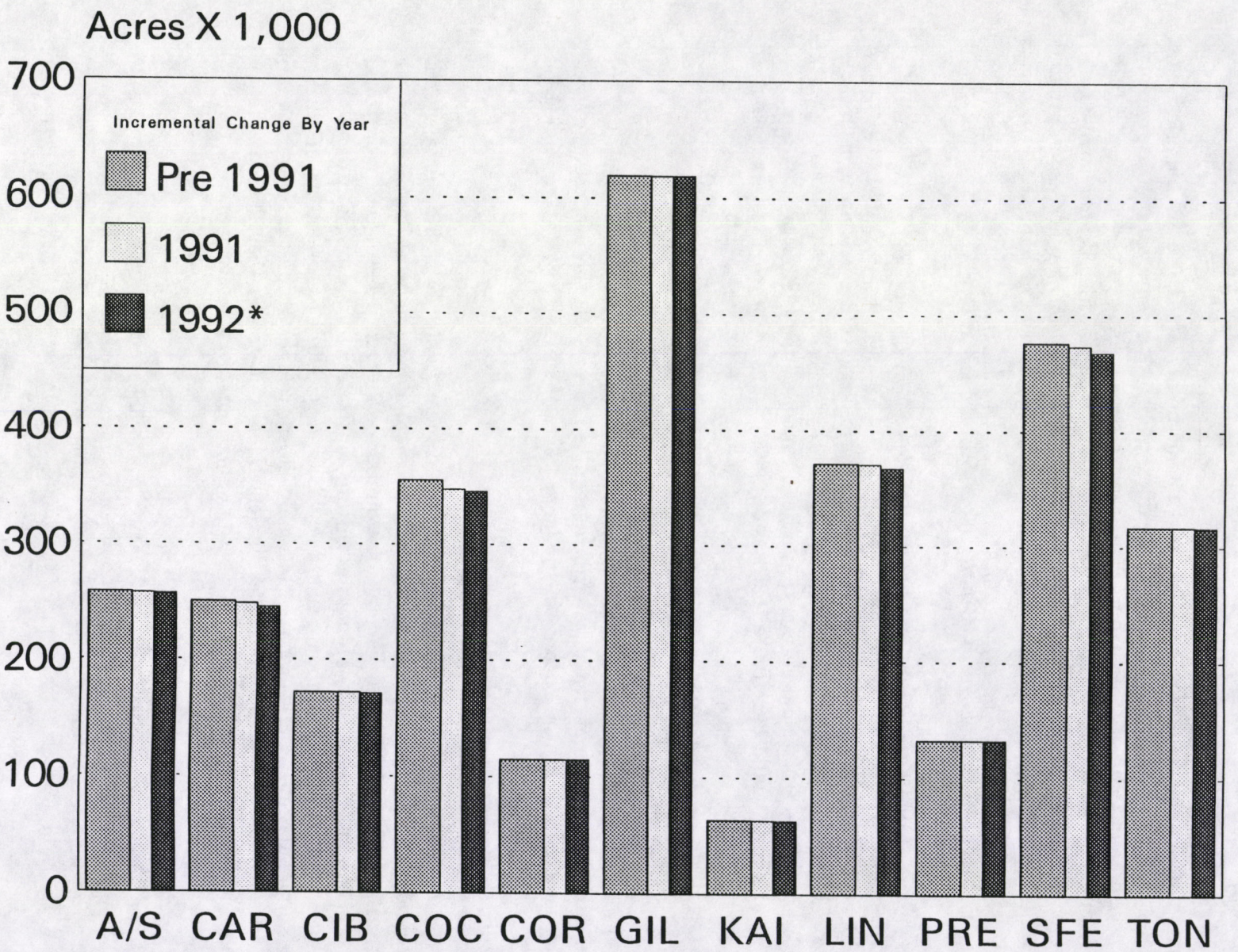
No activities on either Forest will affect any MTs or cause any loss of dispersal habitats. Some suitable, but unoccupied, habitat will be modified. However, the proposed activities are not considered substantial because of the large tracts of suitable habitat remaining.

Southern Zone

Habitats and subpopulations in the Southern Zone appear relatively stable. A fairly contiguous subpopulation exists between Flagstaff, Arizona, along the Mogollon Rim into the Mogollon, Black, San Mateo, and Magdalena Mountain ranges. Another large concentration of owls occur in the Sacramento Mountains on Lincoln National Forest. Both populations include well over the 20-pair minimum that Thomas *et al.* (1990) determined was needed for a stable subpopulation. The Coronado National Forest archipelago of scattered mountain ranges with suitable habitat includes the Pinaleno Mountain range, with 26 MTs, as well as ranges with smaller clusters of owls. These populations likely interact and there is still potential for discovering more pairs.

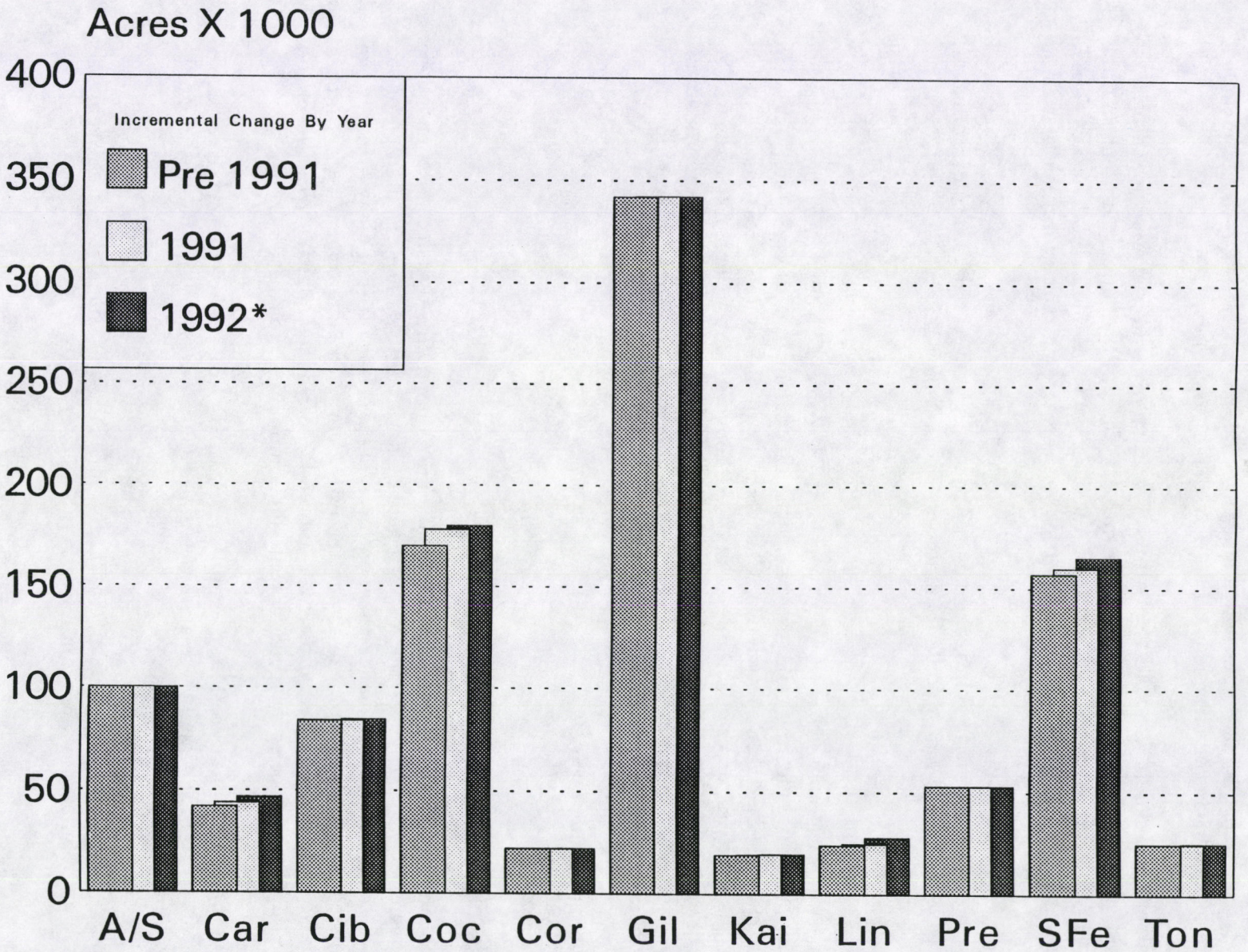
Some MTs within the Southern Zone include fewer than 1,000 acres of suitable habitat. Since these MTs provide less than the mean amount of recommended suitable habitat, they may be unable to support reproduction even if they support an owl pair. Losses or unsuitability of these MTs could interfere with connections among owls in portions of the Southern Zone.

A description of effects, by Forest, is found in Appendix B.



* Change in amount of suitable habitat as a result of proposed 92 and first quarter 93 activities.

Figure 9. Suitable Mexican spotted owl Habitat on National Forest Land, Southwestern Region.



* Change in amount of capable habitat as a result of proposed 92 and first quarter 93 activities.

Figure 10. Capable Mexican spotted owl Habitat on National Forest Land, Southwestern Region.

FINDINGS AND RECOMMENDATIONS

All Forests

This analysis assumed all activities will comply with ID No. 2. Each MT should include a minimum of 1,000 acres of suitable habitat (if available) to comply.

Forest supervisors should assure that 1) all proposed activities have been reviewed by biologists and silviculturists for full compliance with ID No. 2, 2) retain all adjacent suitable habitat to MT's where there are fewer than 1,000 acres of suitable habitat in a MT and, 3) document this analysis. The findings that follow are based on the assumption that these conditions have been met.

Southern Zone - Prescott, Tonto, Coconino, Apache-Sitgreaves, Gila, Lincoln, Coronado, and the Magdalena and San Mateo Mountains of Cibola National Forest:

Situation

The density of owls and owl clusters in the Southern Zone is high. Many owl clusters exceed 20 pairs fully meeting standards set by the ISC (Thomas *et al.* 1990) for long-term management of the northern spotted owl. Clusters are well-distributed across this zone. FY 1992 actions affect few acres of suitable habitat. Although small portions of habitat will be temporarily degraded, it is expected that most pairs would be retained. Some reproduction could be affected. The persistence of owl clusters would not be appreciably reduced. It is very unlikely that this loss would contribute to a reduction of viability of the Mexican spotted owl. Persistence of Mexican spotted owls in this portion of the range is likely both in the short and long term.

Finding

Individual and cumulative actions proposed for FY 92 may indirectly affect owls and their reproduction but will not cause the loss of population viability, reduce distribution of the subspecies, or foreclose future management options. These actions are not likely to jeopardize the continued existence of the Mexican spotted owl. Continued management under Interim Directive No. 2 is not expected, directly or indirectly, to reduce appreciably the likelihood of survival of the subspecies by reducing reproduction, numbers, or distribution.

Recommendations - Ensure 1) full compliance with ID No. 2 and 2) retain all adjacent suitable habitat to MTs where there are fewer than 1,000 acres of suitable habitat in a MT.

Northern Zone - Kaibab, Carson, Santa Fe, and Cibola National Forests except the Magdalena and San Mateo Mountain ranges:

Situation (Kaibab and Carson National Forests)

These two Forests are on the northern extremes of the owl's range and, probably as a result, occupancy of apparently suitable habitat is very low. Any reproductive efforts is very important to persistence of the owl here. The only known reproductive pairs are on the southern part of the Kaibab and on the disjunct, Jicarilla Mountain portion of the Carson.

Finding (Kaibab and Carson National Forests)

No activities on either Forest will affect any MTs nor cause any sizeable degradation of dispersal habitats. Actions could affect unoccupied, apparently suitable habitat, although the question remains whether this habitat is actually suitable. Although there is a small possibility of affecting individual owls, there would be no effect on viability or distribution of the subspecies. These actions will not foreclose any future conservation measures and will not jeopardize continued existence of the subspecies.

Recommendations - Ensure 1) full compliance with ID No. 2 and 2) retain all adjacent suitable habitat to MTs where there are fewer than 1,000 acres of suitable habitat in a MT.

Situation (Santa Fe and Cibola National Forests, except Magdalena and San Mateo Mountains)

Existing data suggests that low occupancy and reproductive problems may be occurring. Also, subpopulations are linked over greater dispersal distances than in other parts of the Range. Each link in this stretched chain may be very important for dispersal as well as reproductive needs. Those small populations that do exist in this portion of the range do not meet the cluster standard of 20+ pairs set for stability of the northern spotted owl. These factors were of considerable concern to the Biological Evaluation Review Team. Any activities degrading habitat in this portion of the range were considered serious.

In the Jemez Mountains, small clusters of owls likely interact. None of these clusters *have* 20 pairs, although they collectively *total* over 20 pairs. It may be that these small clusters interact readily and function as would a 20-pair area. However, this is unknown and until further data on reproduction and occupancy are obtained and analyzed, any habitat manipulation or potential disturbance to owls should be done with caution.

Santa Fe and Cibola National Forests likely support breeding and dispersing owls that maintain a sizeable portion of northern parts of the range.

Finding (Santa Fe and Cibola National Forests, except Magdalena and San Mateo Mountains)

Our concern for the owl in this portion of its range us accebtyated by lack of solid reproductive and occupancy information. Our biologically conservative recommendation is to avoid actions affecting the potential to support 20+ pairs in clusters. Any actions proposed may adversely affect both individuals and reproduction by reducing habitat in this portion of the

owl's range. However, continued management of the owl under ID No. 2 is not expected, directly or indirectly, to reduce appreciably the likelihood of survival of the subspecies. Therefore, it would not jeopardize the owl's continued existence.

Recommendations - We recommend no suitable habitat be modified to become less suitable and any modifications in capable habitat should serve only to accelerate growth toward suitability. Because of the owl's apparent tenuous hold on these Forests, as identified by the Biological Evaluation Review Team, there is a concern that 1992 actions would contribute to loss of distribution in this portion of the subspecies' range. If this recommendation is followed, we find that the proposed 1992 actions will have no effect on individuals, populations, or subspecies' range.

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APPENDIX A

Current Situation by Forest

Apache-Sitgreaves National Forests

There are 80 MTs and 3 HMAs (Table A1; Figure A1) on Apache-Sitgreaves National Forests. They average 2,061 acres in size with 1,301 acres of suitable, 622 acre of capable, and 127 acres of unsuitable habitat (Figure A2).

There are two primary population centers, one near the Coconino and Sitgreaves National Forests' boundary (> 25 MTs) and the other adjacent to Blue Range Primitive Area (>20 MTs). The Sitgreaves area is believed to be biologically contiguous with the Coconino and Tonto subpopulations. The Blue Range area is not directly linked to the Sitgreaves subpopulation but may have a closer link with the subpopulation area on Gila National Forest to the east. The habitat of Coconino/Sigreaves and Blue Range is primarily ponderosa pine with mixed conifer found at higher elevations and in canyons. The White Mountain Apache Indian Reservation partially separates these two population. The Apache lands may significantly link the two subpopulations as one biologically contiguous unit.

That portion of the Sitgreaves above the Mogollon Rim between the two subpopulations has small, isolated patches of suitable habitat. Habitat is fairly open ponderosa pine and pinon-juniper woodlands with no owls.

Apache-Sitgreaves National Forests were heavily harvested around the turn of the century. Present conditions reflect past activity. Minor amounts of late seral forest conditions exist. The Forest has a predominance of 60- to 80-year-old stands.

Critical attributes, such as nest trees, are often residual components found remaining from turn of century harvests and are only in canyons or on steep slopes.

The 3 HMAs on the Apache-Sitgreaves make up the central portion of the Mogollon Complex. HMA 1 is adjacent to HMAs on Coconino (#7) and Tonto (#5) National Forests. This nearest-neighbor HMA information as well as nearest 20-or-more-pair HMA (>20) is presented by Forest in Table A2. Suitable habitat occurs in a few large blocks but mostly in small to medium-sized patches associated with canyons. The HMA contains a high density of MTs.

HMAs 2 and 3, on the east end of the Forest tie into the Mogollon Complex in New Mexico. Suitable habitat in HMA 2 consists of small, scattered patches and few large to medium-sized blocks. HMA 2 contains a low density of MTs (Table A1). HMA 3 contains a very high density of MTs. HMA 2 is about 47 miles from HMA 1 and 3 miles from HMA 3. HMA 3 has the largest blocks of contiguous habitat in Arizona, some smaller patches occur between the blocks. We believe that HMAs 1 and 3 serve as significant owl reproductive centers for the Mogollon Complex because of the high number of MTs.

HMA 2 is about 47 miles from HMA 1 and only 3 miles from HMA 3 (Figure 8). HMA's 1 and 3 serve as significant owl reproductive centers for the Mogollon Complex because of the high number of MTs.

The 3 Apache-Sitgreaves HMAs make up the central portion of the Mogollon Complex. HMA 1 is adjacent to HMAs on the Coconino and Tonto National Forests. Suitable habitat occurs in a few large blocks but mostly in small to medium size patches associated with canyons. The HMA contains a high density of MTs.

Carson National Forest

There are three MTs on Carson National Forest (Figure A1). They average 1,977 acres in size with 1,173 acres of suitable, 218 acres of capable, and 586 acres of unsuitable habitat (Figure A3).

The Carson has two geographic units. Both units extend north to the Colorado state line. The east unit is the southern extension of the Sangre de Cristo Mountain range originating in Colorado. The disjunct Forest unit to the west, is the Jicarilla division of the Forest, has the only confirmed pairs of spotted owls.

Considerable portions of the Sangre de Cristos have been mapped as suitable habitat and surveyed. At this time, however, no confirmed pairs of owls have been located. Significant snow depths in large portions of this habitat may severely limit ground-dwelling prey needed by the owl during the winter months; thereby limiting the habitat for juvenile dispersal only. No other plausible explanations exist. This habitat may provide a link between occupied habitats on the Santa Fe National Forest to the south and some very limited occurences of owls in southern Colorado to the north.

The Jicarilla Division is a narrow strip of land running north to south from the Colorado line. The habitat is pinyon-juniper woodland; however, it is broken by several drainages containing suitable habitat where the three owl territories are located. This portion of the Forest is not commercial forest and no activities are planned that will affect the owl. It is likely owls exist on adjacent lands of the Jicarilla Apache Indian Reservation.

The HMA on Carson National Forest (Table A1) defines the northernmost extension of owl range in New Mexico. Suitable habitat occurs in small tracts, typically less than 250 acres, separated by 1 to 2 miles. The nearest MT to the HMA is about 32 miles east on Santa Fe National Forest. We believe owls inhabiting the Carson HMA are likely to experience periodic extirpation, potentially followed by immigration of owls from Santa Fe National Forest or other proximate subpopulations. The HMA occurs near the northern extremes of the subspecies range. It is relatively isolated, and provides minimal suitable habitat. The contribution to the Regionwide subpopulation is crucial to maintaining owls distribution.

Cibola National Forest

There are 26 MTs (Figure A1) and 7 HMAs (Table A1) on Cibola National Forest. The MTs average 1,968 acres in size with 1,435 acres of suitable, 86 acres of capable, and 447 acres of unsuitable habitat (Figure A4). Owls may exist in the canyons on private lands adjacent to the Forest.

The Cibola has geographically separate mountain ranges relatively isolated from each other. The genetic interchange may be very low between some of these subpopulations. The Sandia, Manzano, and Gallina Mountains represent a distinct north-south chain between Lincoln and Santa Fe National Forests. Intervening segments between these ranges are pinyon/juniper woodland and grassland habitats. The Zuni and Mount Taylor ranges are relatively isolated by significant expanses of non-forested communities. The Magdalena and San Mateo Mountains are similarly lacking linkage by forested habitat.

The Zuni Mountains contain the most northern cluster of owls on the Cibola with several pairs that reproduce consistently. Private land logging is currently a significant concern for species in the Zuni Mountains and, to a lesser degree, on Mt. Taylor.

None of the Cibola HMAs are known to support 20 or more owl sites. Maintenance of all suitable habitat is important. We believe the Cibola plays an important role in facilitating dispersal and genetic interchange between the Mogollon and Southern New Mexico Complexes and Santa Fe National Forest.

HMAs 3 and 4 provide limited areas of suitable habitat for reproductive pairs but collectively support 3 MTs. The relatively isolated Manzano and Sandia ranges may provide an important landscape link between the HMAs on Lincoln and Santa Fe National Forests.

HMAs 5 and 6 are in the Magdalena and San Mateo Mountains, respectively. Both contain contiguous suitable habitat with owl MTs. More owls are expected with further inventory. These subpopulations are likely to experience occasional extirpation.

HMAs 1 and 7 are on the Zuni Mountains and Mt. Taylor and are believed to interact readily. With a combined total of 10 MTs, this area has a relatively high possibility of periodic extirpation. Currently available delineations indicate there is very little suitable habitat on the Zuni Mountains and Mount Taylor as it is defined in ID No. 2.

We believe these HMAs are an important component of the fragile Northern Zone. Both mountain ranges have a major role in facilitating owl dispersal across the landscape. They provide the closest areas of suitable habitat to the southern HMAs on Santa Fe National Forest, some 50 miles distant. We believe long-term stability of the Northern Zone may depend upon retention of currently suitable habitat and recovery of capable habitat where it occurs in the Zuni Mountains to support a future 20+ pairs on the Zuni-Mount Taylor area. Four of nine MTs may not currently have enough habitat to provide for reproduction (Cibola National Forest biologists, pers comm).

Coconino National Forest

There are 113 MTs (Figure A1) and 7 HMAs (Table A1) identified on Coconino National Forest. The MTs average 2,076 acres in size with 1,063 acres of suitable, 819 acres of capable, and 204 acres of unsuitable habitat (Figure A5).

HMAs 1, 2, 4, and 6 currently support fewer than 15 MTs, and they are likely to experience periodic extirpations. HMAs 3, 5, and 7 are considered reproductive centers because they include 20 or more MTs and are very stable. Four of the MTs near proposed actions are below the interim direction of 1,000 acres of suitable habitat.

There are three major population areas on the Coconino: 1) the San Francisco Peaks and Mount Elden area (containing 8 MTs, with a potential for 15 total); 2) the Sycamore Canyon/Central Coconino area (containing 49 MTs, with a potential for 51 total); and 3) the Mogollon Rim area (containing 15 MT, with a potential for 20 total). These areas provide a relatively contiguous zone of suitable habitat across the Forest.

The San Francisco Peaks contains several large blocks of habitat associated with a volcanic mountain. This area links other areas such as Kendrick Peak on Kaibab National Forest to areas extending south on the Coconino. There is a large area of habitat extending southeast from Sycamore Canyon, adjacent to the Kaibab National Forest, to near the Mogollon Rim. This area contains much owl habitat associated with numerous volcanic cones and canyons that divide the relatively flat Colorado Plateau south of Flagstaff. The suitable habitat in these two areas is generally fragmented; however, there are some large tracts associated with the volcanic cones and several canyons. Ponderosa pine and Gambel oak are the dominant vegetation and limited areas of mixed-conifer forest occurs in canyons, at higher elevations, and on the north sides of volcanic cones.

The Mogollon Rim is the most topographically diverse part of the Forest. Many drainages running south to north into East Clear Creek dissect flattened ridges dominated by ponderosa pine. These canyons contain high-quality, mixed-conifer habitat and most have small streams and riparian shrub communities. Large blocks of suitable habitat are found primarily in the drainages. This area is an important link between areas on Apache-Sitgreaves National Forests to the east and Tonto National Forest to the south.

Most of the area has been modified by past timber treatments. Some areas near Flagstaff have been treated several times and much of the forest overstory has been removed. The residual forest is composed largely of mid-seral stages of ponderosa pine. Areas along the Mogollon Rim have been entered fewer times and, as a result, still retain much of the original overstory. Substantial areas of Coconino National Forest are steep, inaccessible, and typically retain overstory canopies.

The seven HMAs define the northern segment of the Mogollon Complex in Arizona. The greatest distance between HMAs is eight miles; many HMAs are within one mile of each other (Figure 8). All HMAs contain large to moderate-sized blocks of suitable habitat, plus

a varying number of small tracts of suitable habitat. The larger tracts are concentrated on volcanic cones and in canyons.

For 1991, 77 percent of the MTs were occupied by owl pairs. They produced an average 0.81 young/pair. These data are slightly above Regional averages for the percent of MTs occupied by pairs and slightly below the Regional average for number of young per pair. This occupancy rate and reproductive success is relatively good compared to other portions of the Southwestern Region.

Coronado National Forest

There are 83 MTs (Figure A1) and 10 HMAs (Table A1) on Coronado National Forest. The MTs average 2,157 total acres including 979 acres of suitable, 456 acres of capable, and 722 acres of unsuitable owl habitat (Figure A6). MT densities are highest in HMA 8 (26 MTs) and HMA 6 (15 MTs). Other HMAs currently have nine or fewer MTs.

Geographically separate mountain ranges are relatively isolated from each other and lack forested links. Most contain Mexican spotted owls. Some lack inventories; however, Forest biologists believe each mountain range contains a small owl population. The genetic interchange between these populations may be low. Owl subpopulations inhabiting these mountain ranges are expected to infrequently disperse to the southern Apache-Sitgreaves National Forests and the White Mountain and San Carlos Apache Indian Reservations. We have no current data on owl populations on these Reservations and, to our knowledge, have not been inventoried. Subpopulations on Coronado National Forest may also provide a link to owls in Mexico.

The Pinaleno Mountains contain 26 known MTs. The Santa Catalina's contain 14 MTs, with little chance of additional MTs; the Huachucas have 9 MTs, with potential for 21; and the Santa Ritas have 8 MTs, with the potential for a total of 8. These are all relatively isolated by expanses of nonforested vegetation. These areas contain the major known occurrences on the Coronado. Suitable habitat ranges from good to excellent in and around the MTs. Survey results and existing habitat conditions in the Pajarita Mountains suggest that the population potential is relatively low and may be near the capability for this subspecies; however, there is one pair that reproduces consistently.

The remaining subpopulations occur in the Patagonia and Dragoon Mountains. Limited suitable habitat is high quality. Other potentially productive ranges that have yet to be surveyed include the Galiuro and Chiricahua Mountains to the southeast. These mountains contain blocks of habitat that appear suitable for owls. Past Forest Service timber management actions modified habitat used by the Forest's major owl populations, changing the habitat suitability to some degree in the Santa Catalina and Santa Rita Mountains. There is also inherent natural fragmentation of habitat due to geology, aspects, and topography of the mountain ranges.

The 10 HMAs on Coronado National Forest form the Coronado Complex and define the southernmost extent of owl range in Arizona. Distances between HMAs in this complex vary from an extreme of 62 miles (HMA 5 to HMA 10) to 11 miles (HMA 3 to HMA 4). The mean distance between HMAs is 20.7 miles (Table A2) on the Forest. The closest distances to HMAs in other complexes are about 52 miles to the Tonto Complex and 62 miles to the Mogollon Complex.

Because of their relatively high numbers of MTs, HMAs 6 and 8 serve as the best owl production areas for the Coronado Complex.

HMAs 1-5, 7, 9, and 10 likely facilitate owl dispersal. Even under ideal conditions, it is unlikely many of the Coronado ranges could support 20 or more MTs. However, the clusters probably interact and support the Complex. The owl juvenile dispersal pattern may emphasize searching natal clusters before searching another mountain range.

Gila National Forest

Gila National Forest has 131 MTs (Figure A1) and nine HMAs (Table A1). They average 2,061 acres in size with 939 acres of suitable, 790 acres of capable, and 332 acres of unsuitable habitat (Figure A7).

Gila National Forest is a very large forest with considerable acreage in three wildernesses. It also encompasses 20 percent of the owls within the range of the species. Two or three times the current number of owl territories are expected. About 30 percent of the suitable habitat has been inventoried.

The suitable habitat is found on the western half of the Forest, adjoining the Arizona state line and Apache-Sitgreaves National Forests. Owls are widely distributed across the Forest except for the Burro Range, but relatively lower densities of owls are found in the northern and eastern portions of the Forest where habitats are more fragmented. The very northern portions of the Forest are highly fragmented from combinations of natural geography, climate, past timber harvest, and historic wildfires. This area probably provides dispersal links to mountain ranges to the north and west of the Gila Forest.

Most of this Forest forms the eastern and southern portions of the Mogollon Rim country, extending westward into central Arizona. This is the most extensive continuum of owl habitat within its range. Large blocks of suitable habitat extends into Gila and Aldo Leopold Wildernesses. The easternmost portion of the Gila is a north-south range of mountains known as the Black Range. Several owls are known to occur in the Black Range, including the southernmost segment. A majority of suitable habitats have not yet been surveyed and numbers of additional owls are expected to be located.

The nine HMAs provide important dispersal habitat and reproductive capacity in the Southern Zone in the Southwestern Region. Gila National Forest is the southeasternmost extension of the contiguous portion of the Mogollon Complex.

Suitable habitat in HMA 1 is limited and occurs in relatively small blocks. This HMA may provide a critically important link facilitating movement of owls between the Mogollon Complex and Cibola National Forest HMAs in the Northern Zone. We consider HMA 1 to be highly fragmented and presently only marginally capable of supporting additional MTs. HMA 1 supports four MTs and is less stable than a larger cluster would be. The long-term, improved stability of this critical landscape link depends heavily upon development of additional reproducing pairs in HMA 1.

HMA 2 is small, consisting of 7,366 acres containing three MTs. HMAs 3 and 5 likely act as a single habitat unit. The combined HMAs include 150,428 acres and 17 MTs. Known suitable habitat occurs as a moderately fragmented band across the south and east side of HMA 3 and is more highly fragmented in other portions of the HMA complex.

HMA 4 includes 99,037 acres and supports 37 known owl MTs. Apparently suitable habitat is moderately fragmented and the HMA supports an extremely high density of MTs. Because HMA 4 supports well over 20 sites, we believe this subpopulation is contributing substantially to the collective owl reproduction in the Southern Complex and has a high likelihood of persistence. HMA 6 includes 125,430 acres and supports 49 known MTs. Large tracts of unfragmented suitable habitat exist in the western, central and southern portions of the HMA. There are other relatively secure HMAs near HMA 6 from which owls could be expected to emigrate over time.

HMAs 7, 8 and 9 provide moderate amounts of suitable habitat in a combined total area of 234,933 acres and support 3, 6, and 11 MTs, respectively.

Kaibab National Forest

Kaibab National Forest has 3 MTs (Figure A1) and 2 HMAs (Table A1). They average 2,363 acres in size with 1,510 acres of suitable, 228 acres of capable, and 625 acres of unsuitable habitat (Figure A8).

Two HMAs contain these three territories. The first (1 MT, potential for a total of 5) ties in with a major subpopulation center on the Coconino in the Sycamore Canyon area which has a significant number of owls. The other area is a minor subpopulation on Kendrick Mountain and Sitgreaves Mountain (2 MTs, potential for a total of 6). They are two distinct cinder cones separated by open ponderosa pine and grassland areas.

The owl management areas on Kaibab National Forest contain small amounts of suitable habitat. Much of the habitat is found at higher elevations, in canyons, and on north-facing slopes. Linkage to other subpopulations is separated by large expanses of open, mid-seral stages of ponderosa pine forest, grassland, and pinon-juniper woodland.

North Kaibab Ranger District is a very large area of ponderosa pine, mixed conifer, and spruce-fir north of the Grand Canyon. This area contains significant amounts of apparently suitable owl habitat. However, surveys completed to date have not confirmed any owls and, as a result, no MTs have been established.

Most of the area that is now Kaibab National Forest has had timber management activities occurring over past years. Present conditions reflect past timber management activity. These activities have created a forest with more open overstories and young understories of ponderosa pine.

The two HMAs identified on Kaibab National Forest (Table A1) define the northernmost extension of owls in Arizona. HMA 1 is about 12 miles north of HMA 2 (Figure 8). HMA 1 contains small, widely scattered parcels and one larger block of suitable habitat. HMA 2 contains small to moderate-sized tracts of suitable habitat separated by several miles. Habitat in HMA 2 is concentrated in the Kendrick and Sitgreaves Mountains. It is assumed that these habitats serve to facilitate owl dispersal rather than functioning as reproductive centers in the Southwestern Region. Because both HMAs are known to currently support fewer than 15 or more owl MTs, they are likely to experience periodic extirpations.

No formal monitoring information is available for the Kaibab in 1991. The Forest has few MTs but they are in close proximity to MTs on the Coconino Forest. It is assumed that the reproduction rate for the Kaibab would be similar to the most northern mountains on the Coconino.

Lincoln National Forest

There are 105 MTs (Figure A1) and two HMAs (Table A1) on Lincoln National Forest. The MTs average 2,000 acres in size with 1,394 acres of suitable, 530 acres of capable, and 76 acres of unsuitable habitat (Figure A9).

The largest population center is the Sacramento Division of the Sacramento Mountain range. Smokey Bear Ranger District also has a subpopulation area on the northern end of this mountain range believed to be biologically contiguous with the Sacramento Division subpopulation. The Mescalero Apache Indian Reservation separates these two Forest Service-administered areas. The Mescalero Apache lands are expected to have a significant number of owls and link the Lincoln subpopulations as one biologically contiguous unit.

The Sacramento Mountain range contains minor amounts of habitat on the west face. Much of the habitat is found at higher elevations and in canyons. The east side contains relatively contiguous forested habitat in a series of broad canyons that run from west to east. Linkage to the Guadalupe Mountains is across pinon-juniper woodlands and grama grassland habitats.

There are historic records of owls on the south end of this mountain range. Linkage to the north with Cibola National Forest's Gallinas Mountain range is over a series of minor mountain ranges that have no suitable or only minor amounts of suitable habitat. These small mountain ranges have a relatively contiguous link of predominantly pinyon-juniper woodland forest.

The Organ, San Andreas, and Oscura Mountain ranges are west of the Forest and separated by predominantly Chihuahuan Desert in the Tularosa Basin. There are historic records of owl occurrence in these ranges, which are linked by intermittent woodland to the north and also eastward, approaching the Gallina Mountains. These present-day links of pinyon and juniper woodlands are probably more pronounced and dense relative to pre-settlement landscape conditions.

The area that is now Lincoln National Forest was heavily harvested around the turn of the century. Present conditions reflect this past activity with minor amounts of late seral forest conditions and a predominance of 60- to 80-year-old stands. Critical attributes such as nest trees are often residual components from historic harvest in what is now a regenerated young or mid-seral forested stand.

The two HMAs identified on Lincoln National Forest (Table A1) define the southeastern-most extension of owl range east of the Mogollon Complex in New Mexico. Both HMA 1 and HMA 2 abut the Mescelaro Apache Indian Reservation. We believe that the owls of Lincoln National Forest and the Reservation are a single, generally contiguous subpopulation. Timber management on the Reservation is viewed as a reasonably forseeable and an adverse effect to owl habitat. HMA 1 forms the northern extension of this complex and includes much of White Mountain Wilderness and the surrounding area. Relatively large blocks of suitable habitat in HMA 1 support eight MTs.

HMA 2 contains large tracts of suitable habitat with varying degrees of fragmentation. The 92 owl MTs in HMA 2 form the densest known concentration of owls. Together with additional sites expected on the Mescalero Apache Tribal Lands, we believe the Sacramento Mountain HMA complex to be an important area supporting reproduction in the Region. Because of the extremely high numbers of owls, the HMA is viewed as having a high probability of persistence. The high density of MTs has likely served to retain substantial options for application of an owl conservation strategy on National Forest lands. We believe this population to be highly resilient as evidenced by the current owl population after extensive railroad logging in the Sacramento Mountains early in this century.

We believe monitoring of known sites on Lincoln National Forest has shown ID No. 2 to provide adequate management to support pairs and reproduction in the subpopulation.

Prescott National Forest

Prescott National Forest has 8 MTs (Figure A1) in 1 HMA (Table A1). The MTs average 1,821 acres in size with 1,252 acres of suitable habitat, 519 acres of capable habitat, and 51 acres of unsuitable habitat (Figure A10).

One HMA occurs on the Forest and is part of the Tonto Complex. This is a relatively isolated HMA with the nearest HMA about 42 miles north in the Mogollon complex (Coconino). Suitable habitat in the HMA occurs in medium-sized to large contiguous blocks associated with mountains and drainages. This HMA is considered to have a low density. The potential for the HMA may be 15 MTs.

The area separating these subpopulations largely consists of juniper woodland, desert, and chaparral habitat types. Much of the owl habitat around the population consists of ponderosa pine along the ridgetops and drainages at elevations of less than 6,000 feet. The lower elevations consist of pinyon-juniper woodland and chaparral. Suitable habitat is scattered with medium to large blocks.

The area that is now Prescott National Forest was harvested early in the century. Present conditions reflect this past activity with late to mid-seral forest conditions predominant.

Very little formal monitoring information is available for the Prescott Forest. One site was formally monitored in 1991. It was occupied by a pair but produced no young. Six MTs were monitored informally; 50 percent had pairs but no young were produced. The sample size on the Forest is too small to get accurate reproduction information.

Santa Fe National Forest

There are 29 MTs (Figure A1) and 7 HMAs (Table A1) on Santa Fe National Forest. The MTs average 2,389 acres in size with 1,675 acres of suitable, 390 acres of capable, and 324 acres of capable habitat (Figure A11). Extensive areas of the Santa Fe providing apparently suitable owl habitat have been inventoried for the presence of owls, but relatively few owls have been located.

Reduced owl densities on Santa Fe National Forest and on the more northern Carson National Forest may be a result of natural factors near the northern extreme of the subspecies' range. Winter conditions are more severe and prolonged in these northern forests and may affect prey availability during crucial portions of the year. Based upon preliminary results of formal monitoring, the rate at which owl pairs occupy MTs on Santa Fe National Forest is estimated to be about half of the Regional average, and the number of young these pairs produce is also about half the Regional average.

None of the Santa Fe HMAs support more than seven MTs, but it is likely that at least owls from the 21 MTs in HMAs 2, 3, 4, and 5 readily interact. Distances between these HMAs range between 0.8 and 3 miles (Table A1). These HMAs support the northernmost 20+ MT

grouping in the Northern Zone and may serve as a reservoir to periodically repopulate Carson National Forest and more northern areas, as well as Cibola National Forest to the south. Cibola HMA 3 and HMA 2 are 29 and 50 miles south of Santa Fe HMA 5, respectively. The intervening landscape is predominantly sparse juniper woodland and grassland communities.

The HMAs (2, 3, 4, and 5) that surround Baca HMA Number 1 contain considerable tracts of apparently suitable habitat. Portions of this HMA were historically harvested with regeneration treatments. These areas are capable habitat that may facilitate dispersal.

We also expect owls from the seven MTs in HMAs 6 and 7 to readily interact. HMAs 6 and 7 are about 1.4 miles apart. HMA 6 contains small tracts of fragmented suitable habitat, while HMA 7 includes relatively large tracts of contiguous suitable habitat, primarily in the western portion of the HMA.

HMA 1 supports one MT, and is one of the most northern HMAs in New Mexico. It is 21 miles from Carson HMA 1 on Jicarilla Ranger District. Santa Fe HMA 1 contains two tracts of suitable habitat of 3,000-5,000 acres, with other suitable tracts between 300 and 1,500 acres. Under ideal conditions, this HMA could support many more MTs. However, it is questionable whether this level of occupancy will ever be reached, given seasonal and climatic conditions in the area.

Jarosa, Mesa Poleo, French Mesa, and Mesa Alta on Coyote Ranger District (Jemez Mountains); and Clara Peak (Jemez Mountains) and Borrego Mesa on Espanola RD (Sangre de Cristo Mountains) are areas where fragmentation is of concern at the local scale. These areas generally have less suitable habitat potential; however, past actions have modified much of what may have been.

Tonto National Forest

There are 39 MTs (Figure A1) and seven HMAs (Table A1) on Tonto National Forest. The MTs average 2,185 acres, including 1,118 acres of suitable, 86 acres of capable, and 981 acres of unsuitable habitat (Figure A12). Those MTs near proposed 1992 actions contain an average of 1,374 acres of suitable habitat.

Most of the suitable owl habitat on the Forest occurs along the face of the Mogollon Rim and on the isolated mountain ranges. Suitable habitat typically occurs in large tracts, separated by expanses of unsuitable habitat containing small scattered patches of suitable areas. Habitat is naturally fragmented due to the geology, aspect, and topography on the Forest. Although the Mogollon Rim subpopulation likely freely interacts with subpopulations on the Mogollon Plateau (Coconino and Apache-Sitgreaves National Forests), the other subpopulations on Tonto National Forest are separated by large expanses of Sonoran Desert, juniper woodland, and chaparral vegetative types.

The primary population center contains 20 MTs (potential for 34 total MTs) (Table A1) and lies along the Mogollon Rim in the northeast corner of the Forest. This HMA is near HMAs

above the Mogollon Rim on the Coconino and Apache-Sitgreaves National Forests and is part of the Mogollon Complex. We believe the subpopulations interact. The HMAs are identified separately only for administrative purposes. Two minor population centers (Pine-Strawberry and East Milk Ranch Point MTs) also occur along the face of the Mogollon Rim in the north and west portions of the Forest. Five somewhat isolated subpopulations (Mazatzals, Sierra Ancha, Penal Mountains, Four Peaks and Ash Creek MTs) occur in the central and southern regions of the Forest.

Habitat on the Forest ranges from Sonoran Desert to ponderosa pine and mixed-conifer vegetative types. The pine belt runs the length of and extends some 10 miles below the Mogollon Rim. Pine types also occur on the isolated mountain ranges throughout the Forest. Patches of juniper woodland occur within the pine habitat. The understory varies from broadleaf hardwoods on more productive sites to manzanita and shrub oak on sites with poorer growing conditions. Mixed-conifer forest is predominantly found at the higher elevations and within the drainages along the Mogollon Rim.

Forests within the area that is now the Tonto National Forest were heavily harvested around the turn of the century and present conditions reflect this past activity. Mature and overmature forest stands are relatively uncommon on Tonto National Forest.

The 7 HMAs on Tonto National Forest are part of two owl complexes in the Region. HMAs 4 and 5 contribute to the Mogollon Complex and HMAs 1, 2, 3, 6, and 7 to the Tonto Complex.

HMAs 4 and 5 are adjacent to HMAs on the Coconino and Apache-Sitgreaves National Forests. Suitable habitat occurs in several contiguous large blocks along the face of the Mogollon Rim and scattered strips and patches associated with drainages of the Mogollon Rim and mountains with north-facing slopes. These two HMAs are currently separated by 10 miles of habitat affected by the Dude Fire in 1990. HMA 5 contains a high density of MTs (22 MTs) and HMA 4 currently has a low density with 2 MTs.

Distances between HMAs 1, 2, 3, 6, and 7 on the forest vary from the extreme of about 30 miles (HMA 2 to HMA 7) to the shortest distance of 14 miles (HMA 2 to HMA 3). The mean distance between Tonto HMAs is 13 miles. Distances to HMAs in other complexes are about 12 miles to the Mogollon and 53 miles to the Coronado Complex.

Because the highest density of MTs on the Forest occurs in HMA 5 (22 MTs), we believe it is a major reproduction center on the Forest. HMAs 1, 2, 3, 4, 5, and 7 each include five or fewer known sites, are scattered across the Forest, and contain limited amounts of suitable habitat.

Formal monitoring of owl sites on Tonto National Forest between 1989 and 1991 shows an average of 78 percent (highest average in the Southwestern Region) of MTs annually occupied by pairs. These sites produced an average of 0.6 young per year (slightly below the Regional average). When this information is broken out into the Mogollon and the Tonto Complex, the results suggest the Mogollon is slightly above the Regional average for MTs with pairs

and below the Regional average for young per pair. In the Tonto Complex, the results show it is above the Regional average for percent MTs with pairs and above the Regional average for young per pair. Based on these averages for 1991, we consider occupancy and reproductive rates on Tonto National Forest to be "moderate to good."

Table A1. HMAs by Forest.

HMA	Total Acres	MT Suitable Acres	Number of MTs	Ranger District
Apache-Sitgreaves NFs				
1	208,936	37,452	37	Chevelon, Heber
2	133,475	32,972	5	Springerville, Alpine
3	317,837	176,872	38	Alpine
Carson NF				
1	80,946	6,460	3	Jicarilla
Cibola NF				
1	73,991	N/A	7	Mt. Taylor
2	19,299	3,339	1	Mt. Taylor
3	26,108	3,896	1	Sandia
4	34,716	13,803	2	Mountainair
5	52,207	24,375	2	Magdalena
6	177,710	90,955	11	Magdalena
7	5,770	N/A	2	Mt. Taylor
Coconino NF				
1	3,169	N/A	1	Peaks
2	110,051	5,783	8	Peaks
3	143,738	5,852	24	Peaks, Sedona
4	62,439	7,270	2	Mormon Lake
5	164,108	31,355	27	Long Valley, Mormon Lake
6	117,290	27,146	4	Long Valley
7	144,915	17,284	20	Blue Ridge
Coronado NF				
1	2,997	N/A	1	Nogales
2	12,402	N/A	8	Nogales
3	5,838	847	1	Sierra Vista
4	73,192	12,451	9	Sierra Vista
5	4,710	827	1	Sierra Vista
6	74,443	13,078	15	Santa Catalina
7	27,043	1,914	3	Safford
8	109,381	23,352	26	Safford
9	5,506	N/A	2	Douglas
10	74,443	N/A	11	Douglas

Table A1. Continued.

HMA	Total Acres	MT Suitable Acres	Number of MTs	Ranger District
Gila NF				
1	124,632	2,546	4	Quemado (Apache-Sitgreaves)
2	7,366	1,524	3	Luna (Apache-Sitgreaves)
3	117,968	8,188	16	Luna, Reserve
4	99,037	20,762	37	Reserve
5	32,460	612	1	Luna
6	125,430	24,367	49	Glenwood, Reserve, Wilderness
7	99,957	1,724	3	Reserve, Black Range, Mimbres, Wilderness
8	26,294	3,907	6	Black Range
9	108,682	6,671	11	Mimbres, Silver City
Kaibab NF				
1	37,260	6,056	1	Williams
2	47,713	8,429	2	Chalender
Lincoln NF				
1	72,516	13,183	8	Smokey Bear
2	279,887	143,909	95	Cloudcroft (Mayhill)
Prescott NF				
1	87,154	17,230	5	Bradshaw
Santa Fe NF				
1	65,257	17,641	1	Cuba
2	56,711	19,958	2	Espanola
3	68,741	37,481	5	Jemez
4	146,867	73,748	7	Jemez
5	110,978	61,119	7	Espanola, Jemez
6	41,489	7,432	2	Pecos/Las Vegas
7	121,021	45,899	5	Pecos/Las Vegas
Tonto NF				
1	74,562	20,529	1	Pleasant Valley
2	35,721	3,868	2	Tonto Basin
3	26,954	5,960	1	Tonto Basin
4	105,226	38,341	2	Payson
5	103,457	40,636	22	Payson, Pleasant Valley
6	4,842	338	1	Globe
7	24,093	5,382	5	Globe

Table A2. Nearest neighbor distances to closest HMA and closest >20-pair HMA or >20-pair HMA cluster. Forest and HMA numbers in parentheses.

HMA	Distance (Mi) to Closest HMA	Distance (Mi) to Closest >20 Pair Area
Apache-Sitgreaves NF		
(01)		
1 **	0 (04/7, 12/5); 15.4 (12/1)	0 (04/7) 1.5 (04/6)
2	3.1 (01/3)	3.1 (01/3)
3 *	0 (06/3); 3.1 (01/2)	13.5 (06.4)
Carson NF		
(02)		
1	21.3 (10/1)	41.6 (10/4)
Cibola NF		
(03)		
1	8.2 (03/7)	75.2 (10/4)
2	21.9 (03/1)	49.5 (10/4)
3	28.2 (03/4)	28.9 (10/5)
4	28.2 (03/3)	67.0 (10/5)
5	11.8 (03/6)	67.9 (06/4)
6	11.8 (03/5)	44.3 (06/4)
7	8.2 (03/1)	88.9 (10/4)
Coconino NF		
(04)		
1	3.8 (04/2)	3.8 (04/2)
2 **	1.1 (04/4)	2.1 (04/5)
3 *	2.1 (04/2)	2.2 (04/5)
4 **	1.1 (04/6)	2.3 (04/5)
5 *	2.2 (04/3)	2.2 (04/3)
6 **	0 (12/4); 1.5 (04/7)	1.5 (04/7)
7 **	0 (12/4, 01/1); 1.5 (04/6)	1.5 (04/6)
Coronado NF		
(05)		
1	23.8 (05/2)	111.9 (05/8)
2	14.0 (05/3)	81.2 (05/8)
3	11.7 (05/4)	89.4 (05/8)
4	11.7 (05/3)	80.1 (05/8)
5	16.9 (05/4)	62.6 (05/8)
6	19.8 (05/7)	42.2 (05/8)
7	15.8 (05/8)	15.8 (05/8)
8 *	15.8 (05/7)	60.3 (01/3)
9	7.6 (05/10)	43.7 (05/8)
10	7.6 (05/9)	54.1 (05/8)

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This Table is read as follows: Apache-Sitgreaves National Forests coded as "(01)" contains HMA number "1," which is less than one mile "0 mi." from Coconino National Forest ("04") HMA "7" and Tonto National Forest ("12") HMA "5." The distance to the closest HMA with 20 or more pairs is provided in the second column and is read in the same manner. Kaibab HMA 1 is less than 1 mile ("0") from Coconino National Forest ("04") HMA "3" and is "2.1" miles from Coconino National Forest ("4") HMA "2."

Table A2. Continued.

HMA	Distance (Mi) to Closest HMA	Distance (Mi) to Closest >20 Pair Area
Gila NF (06)		
1	10.6 (06/4)	10.6 (06/4)
2	6.8 (06/3)	6.8 (06/3)
3 **	1.4 (06/5)	0 (01/3); 10.4 (06/04)
4 *	5.6 (06/6)	5/6 (06/6)
5	1.4 (06/3)	1.4 (06/4)
6 *	4.0 (06/7)	5.6 (06/4)
7	4.0 (06/6)	7.6 (06/4)
8	14.4 (06/7)	32.1 (06/6)
9	14.8 (06/7)	17.5 (06/6)
Kaibab NF (07)		
1 **	0 (04/3); 11.9 (07/2)	0 (04/3); 2.1 (04/2)
2	4.6 (04/2)	4.6 (04/2)
Lincoln NF (08)		
1	18.2	18.2 (08/2) 18.2 (08/2)
2 *	18.2 (08/1)	153.5 (06/4)
Prescott NF (09)		
1	42.3	42.3 (04/3) 42.3 (04/3)
Santa Fe NF (10)		
1	17.6	17.8 (10/2) 20.6 (10/3)
2	2.0 (10/3)	2.0 (10/3)
3 **	0.8 (10/4)	0.8 (10/4)
4 **	0.8 (10/3)	3.0 (10/5)
5 **	3.0 (10/4)	3.0 (10/4)
6 **	1.4 (10/7)	42.8 (10/5)
7 **	1.4 (10/6)	36.3 (10/5)
Tonto NF (12)		
1	18.5	15.4 (12/5) 15.4 (12/5)
2	14.2 (12/3)	37.7 (12/4)
3	12.2 (12/4)	12.2 (12/4)
4	0 (04/5, 04/7); 5.1 (12/5)	5.1 (12/5)
5	0 (01/1); 5.1 (12/4)	5.1 (12/4)
6	18.5 (12/1)	59.9 (01/3)
7	27.4 (12/1)	52.3 (05/8)

***** > 20-pair HMA
****** > 20-pair cluster of HMAs

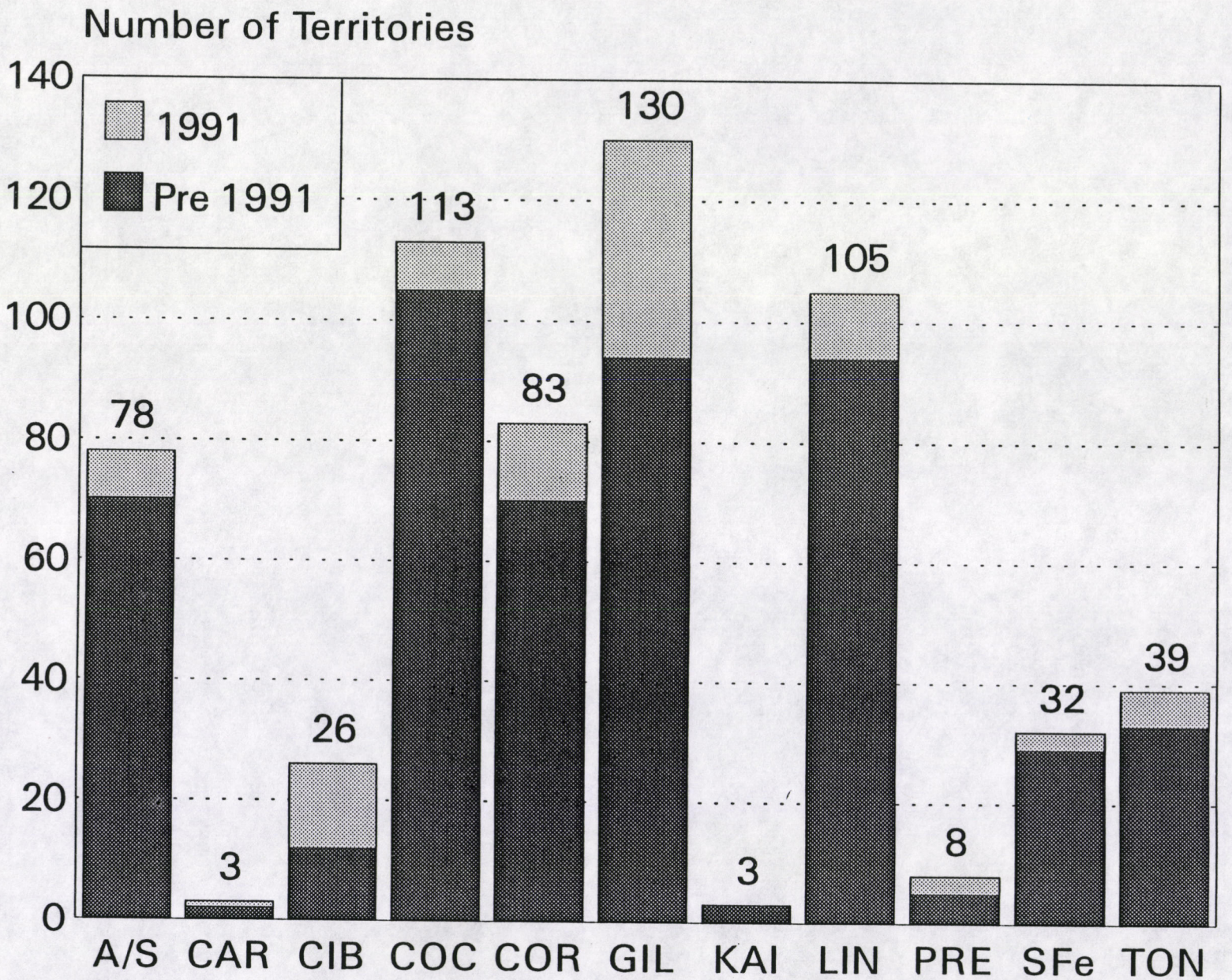

Figure A1. Total number of Management Territories by National Forest, Southwestern Region. Total is 620 as of 1991.

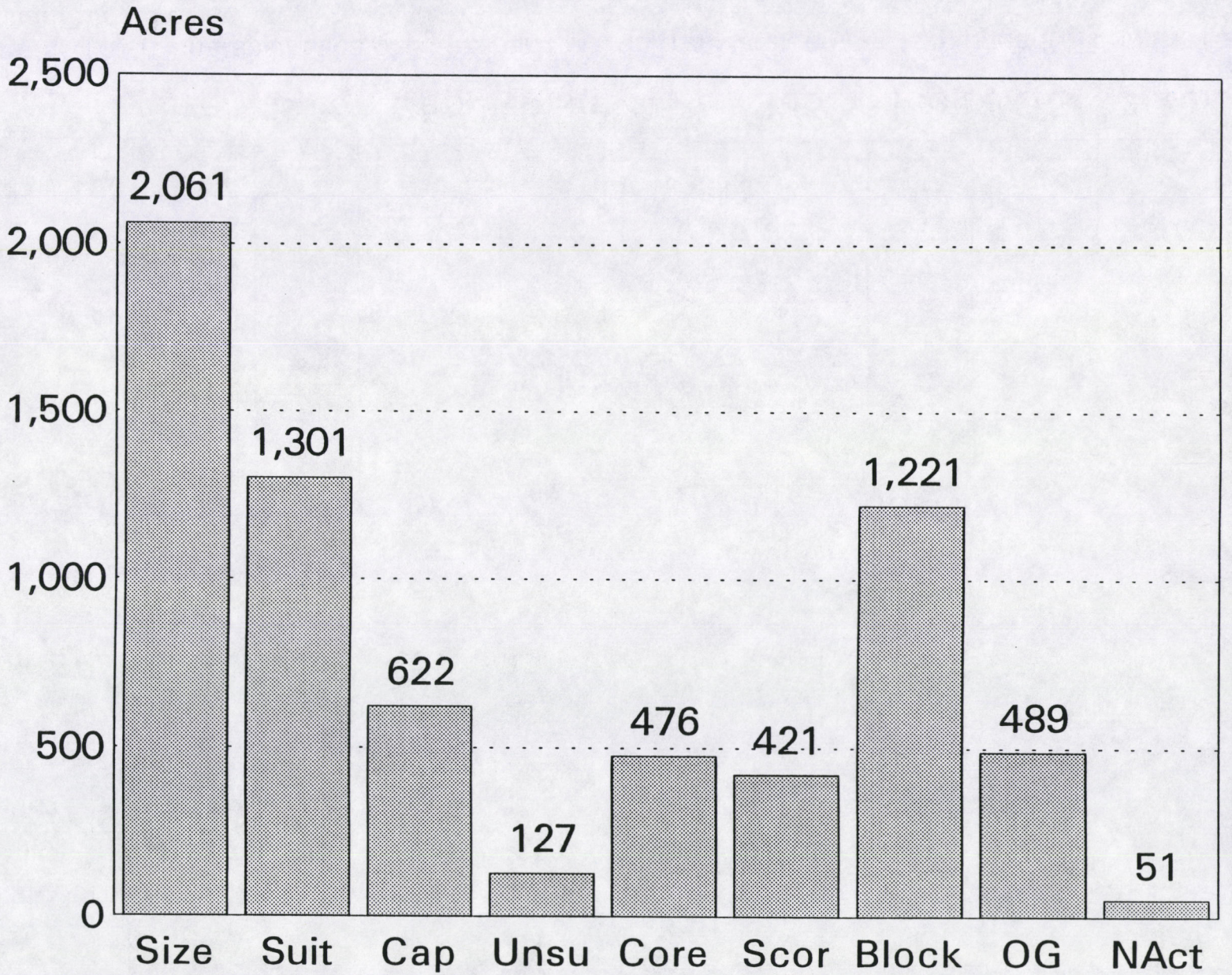

Figure A2. Mean Characteristics of 60 Mexican spotted owl Management Territories (MT) on the Apache-Sitgreaves National Forest in Arizona.

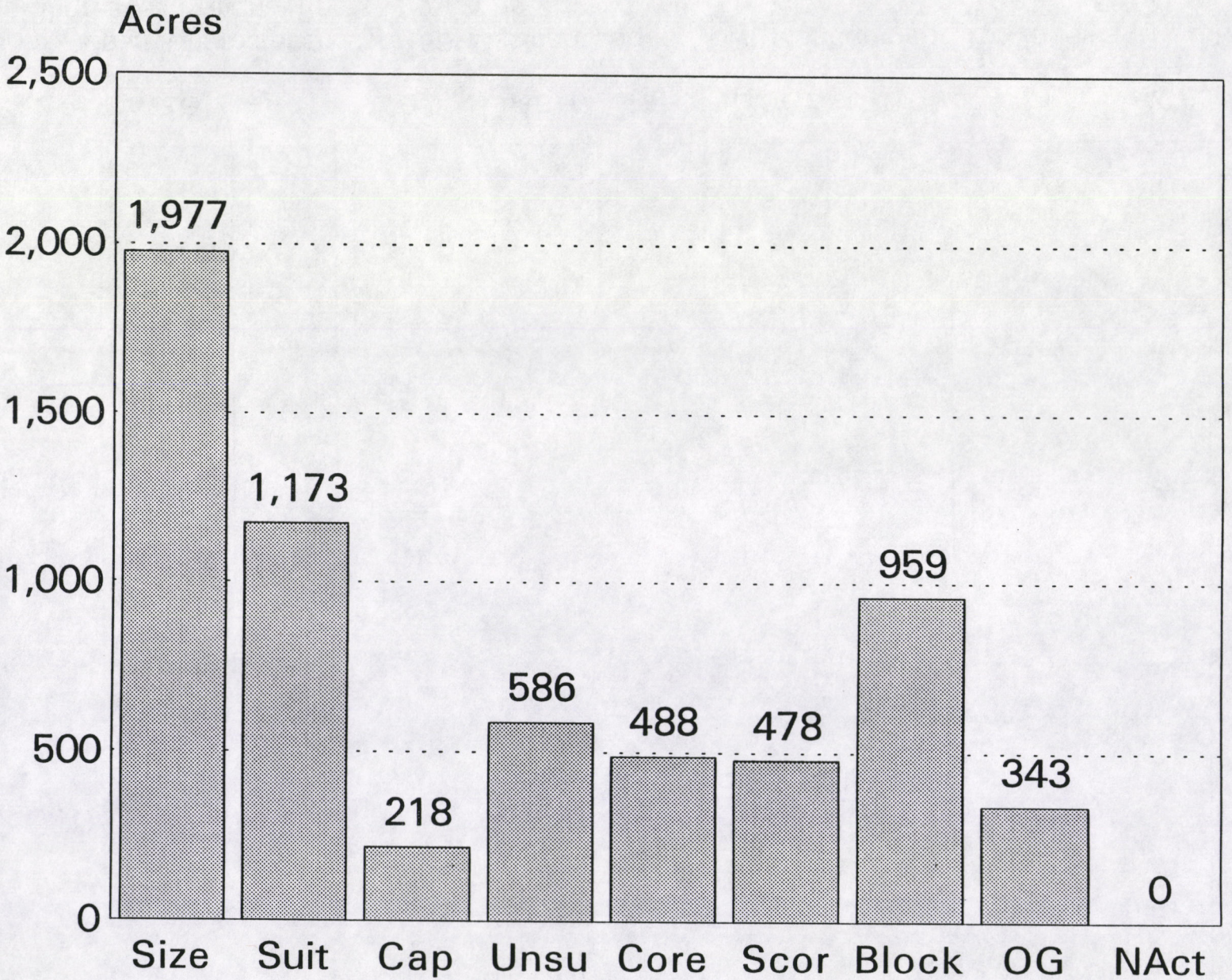

Figure A3. Mean Characteristics of 3 Mexican spotted owl Management Territories (MT) on the Carson National Forest in New Mexico.

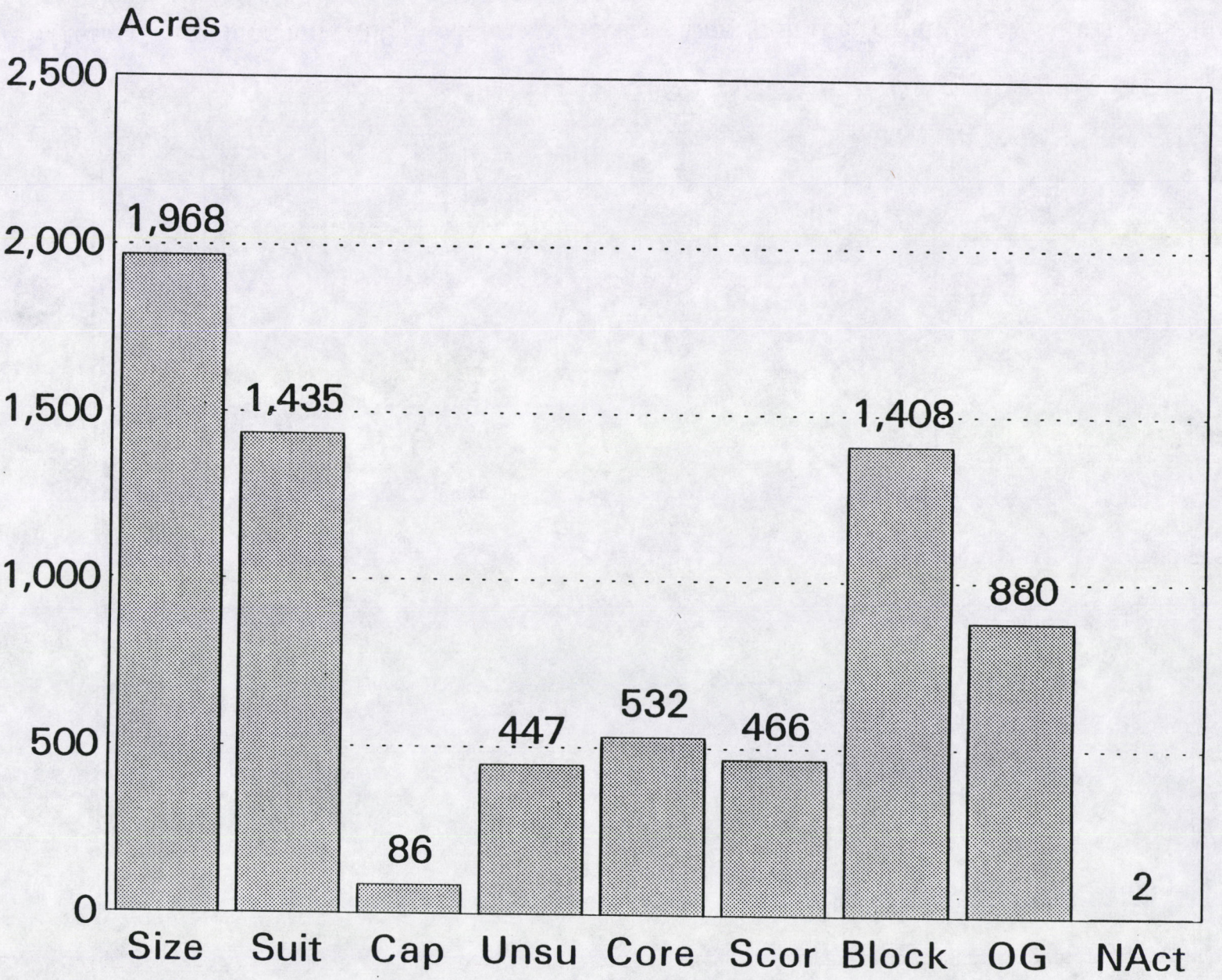

Figure A4. Mean Characteristics of 25 Mexican spotted owl Management Territories (MT) on the Cibola National Forest in New Mexico.

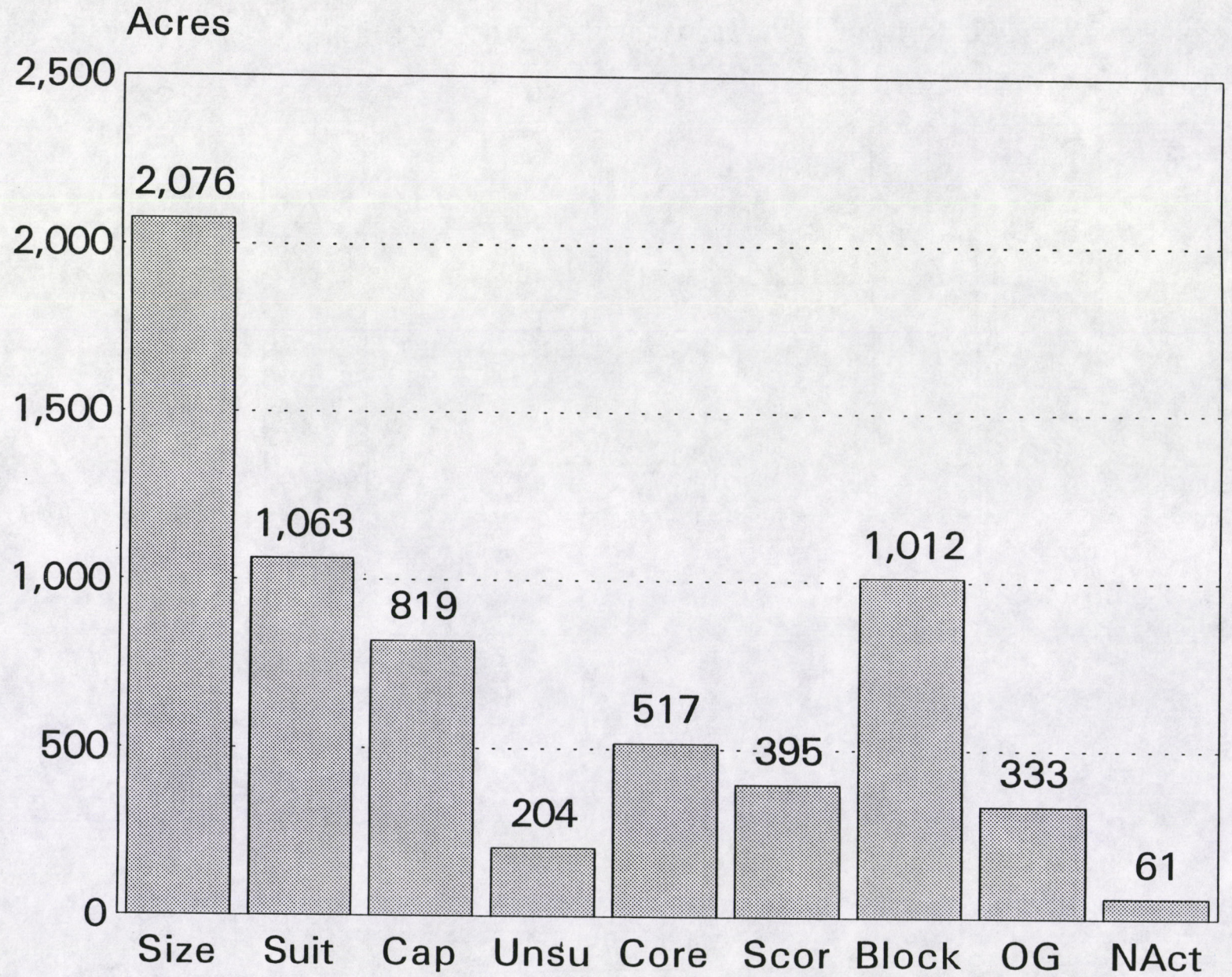

Figure A5. Mean Characteristics of 82 Mexican spotted owl Management Territories (MT) on the Coconino National Forest in Arizona.

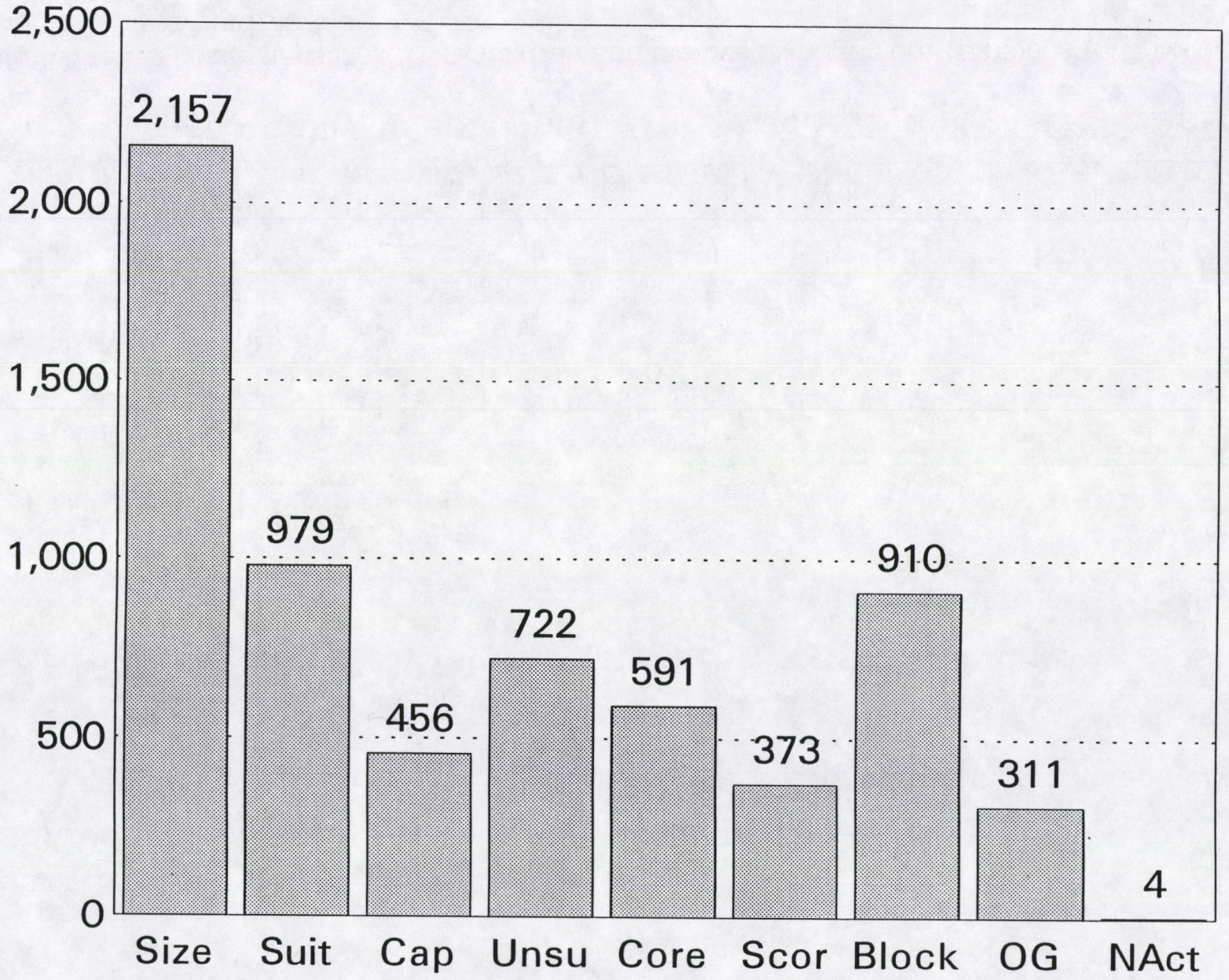

Figure A6. Mean Characteristics of 86 Mexican spotted owl Management Territories (MT) on the Coronado National Forest in Arizona.

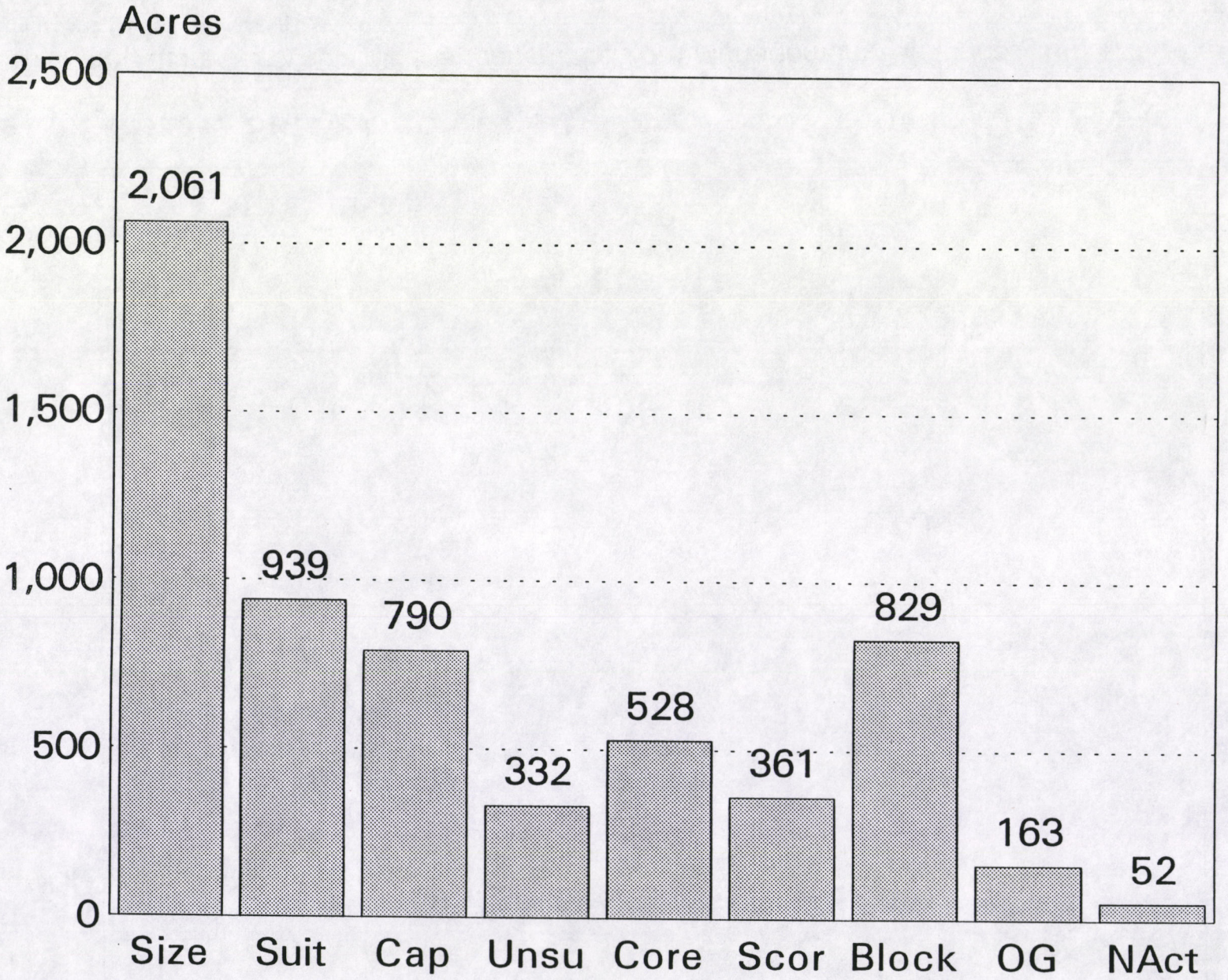

Figure A7. Mean Characteristics of 104 Mexican spotted owl Management Territories (MT) on the Gila National Forest in New Mexico.

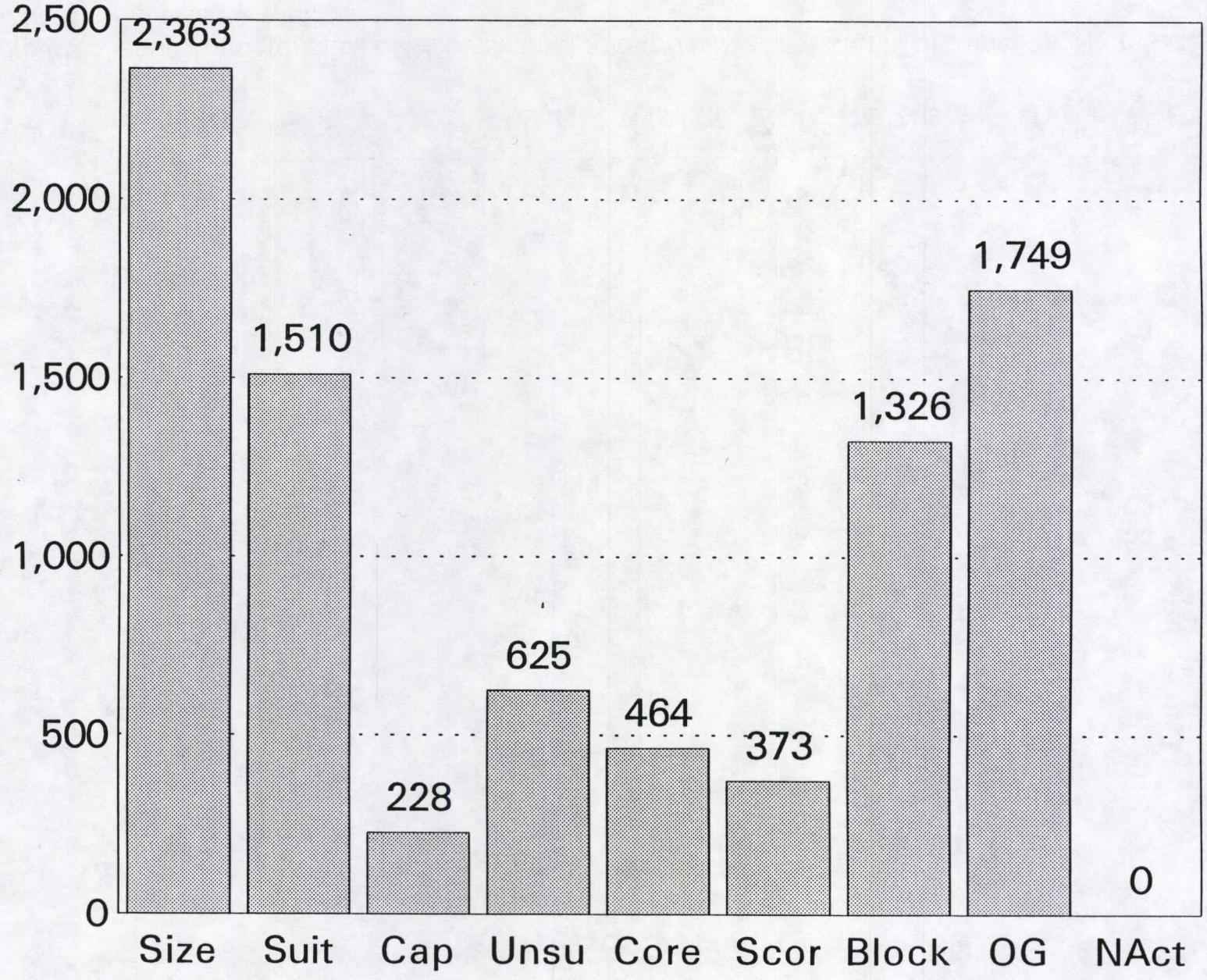

Figure A8. Mean Characteristics of 3 Mexican spotted owl Management Territories (MT) on the Kaibab National Forest in Arizona.

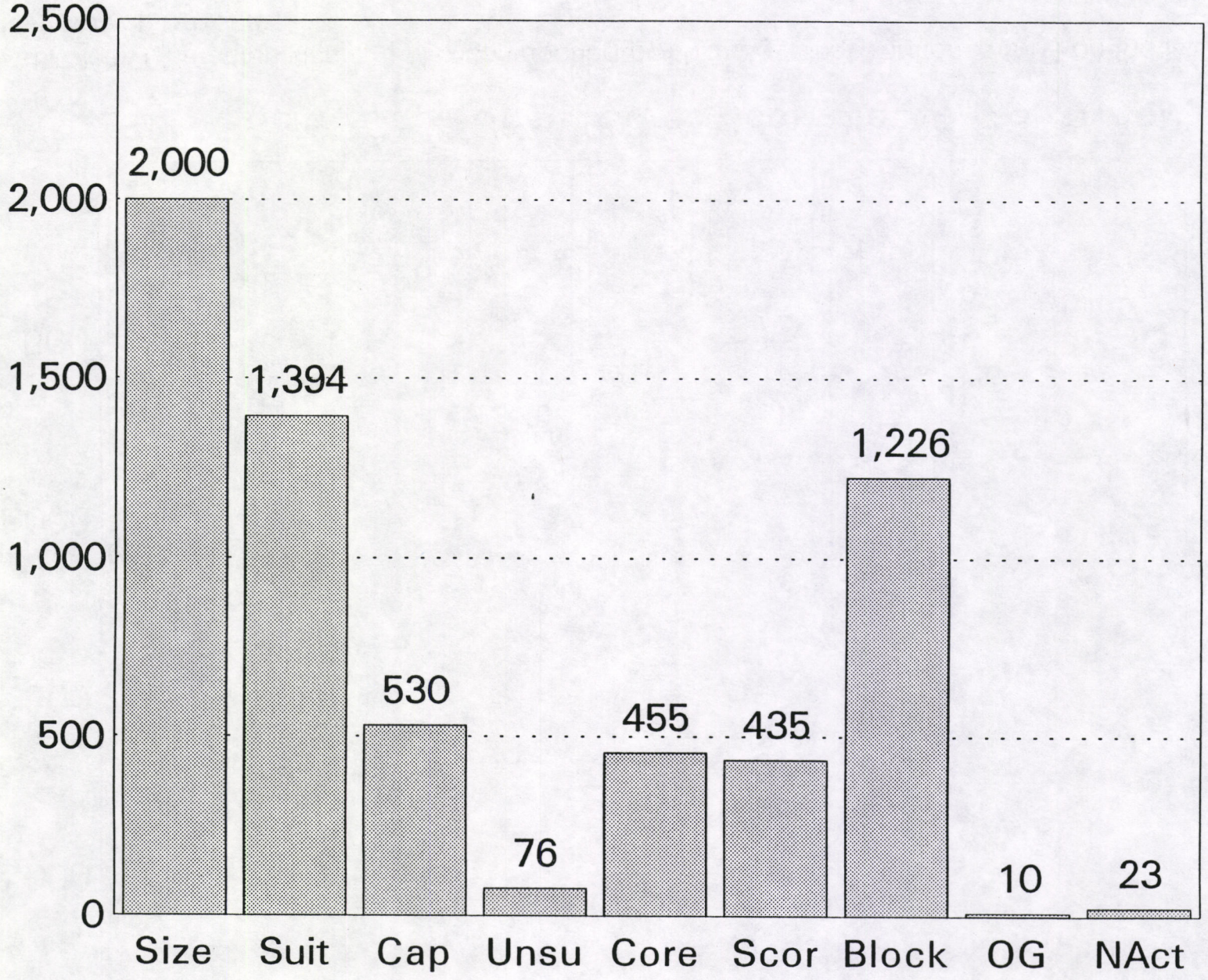

Figure A9. Mean Characteristics of 94 Mexican spotted owl Management Territories (MT) on the Lincoln National Forest in New Mexico.

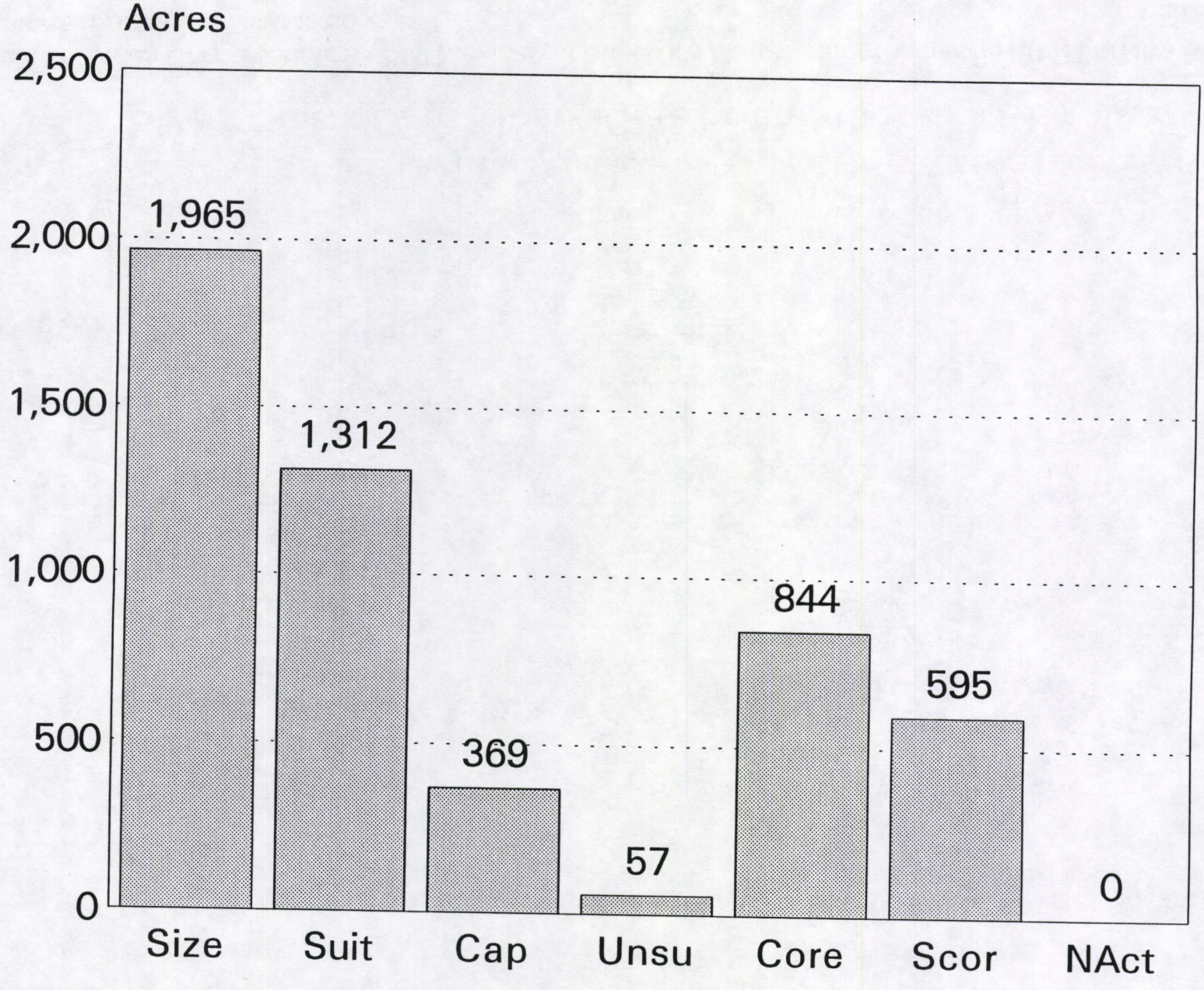

Figure A10. Mean Territory Characteristics of 8 Management Territories on the Prescott National Forest in Arizona, Southwestern Region.

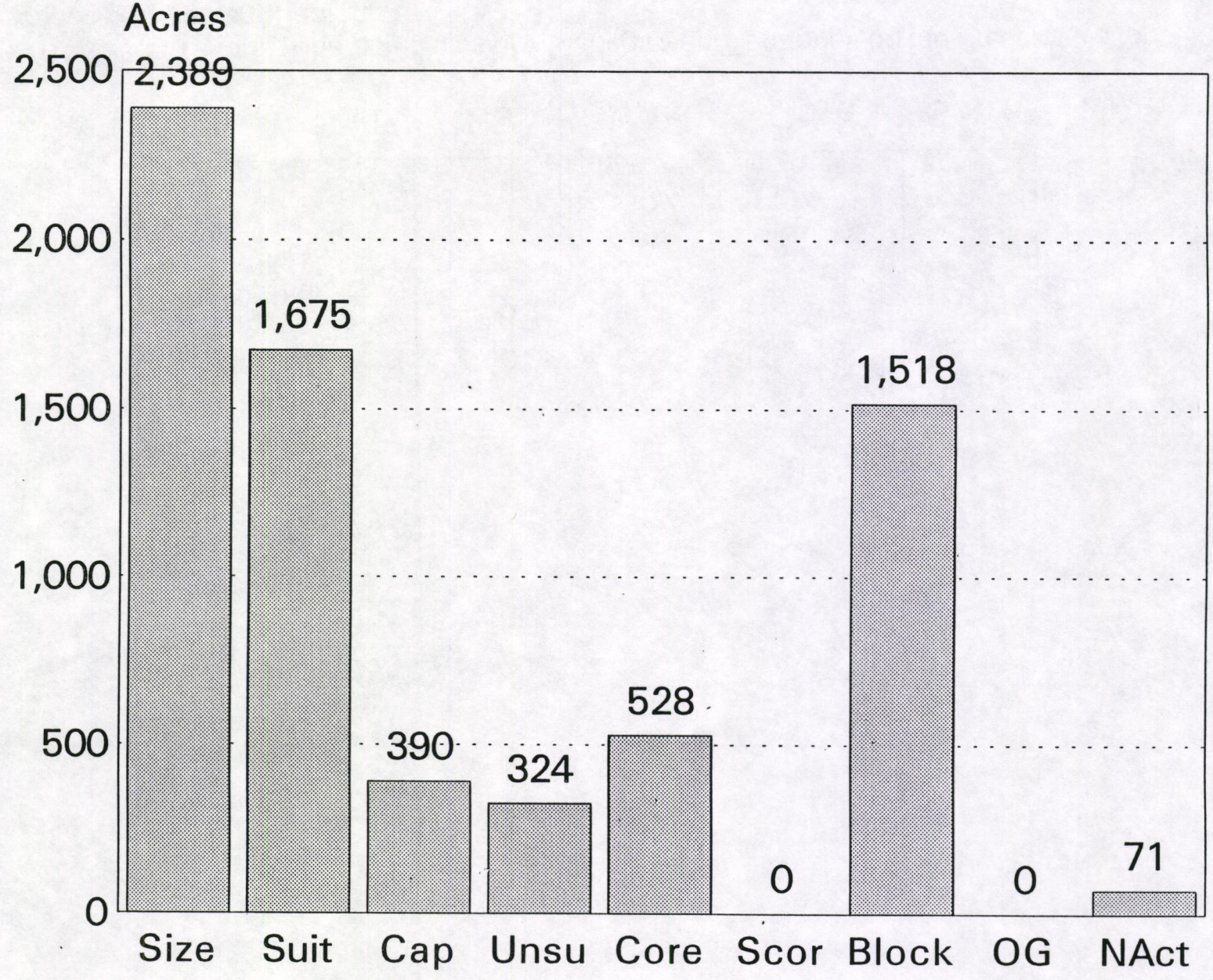

Figure A11. Mean Characteristics of 19 Mexican spotted owl Management Territories (MT) on the Santa Fe National Forest in New Mexico.

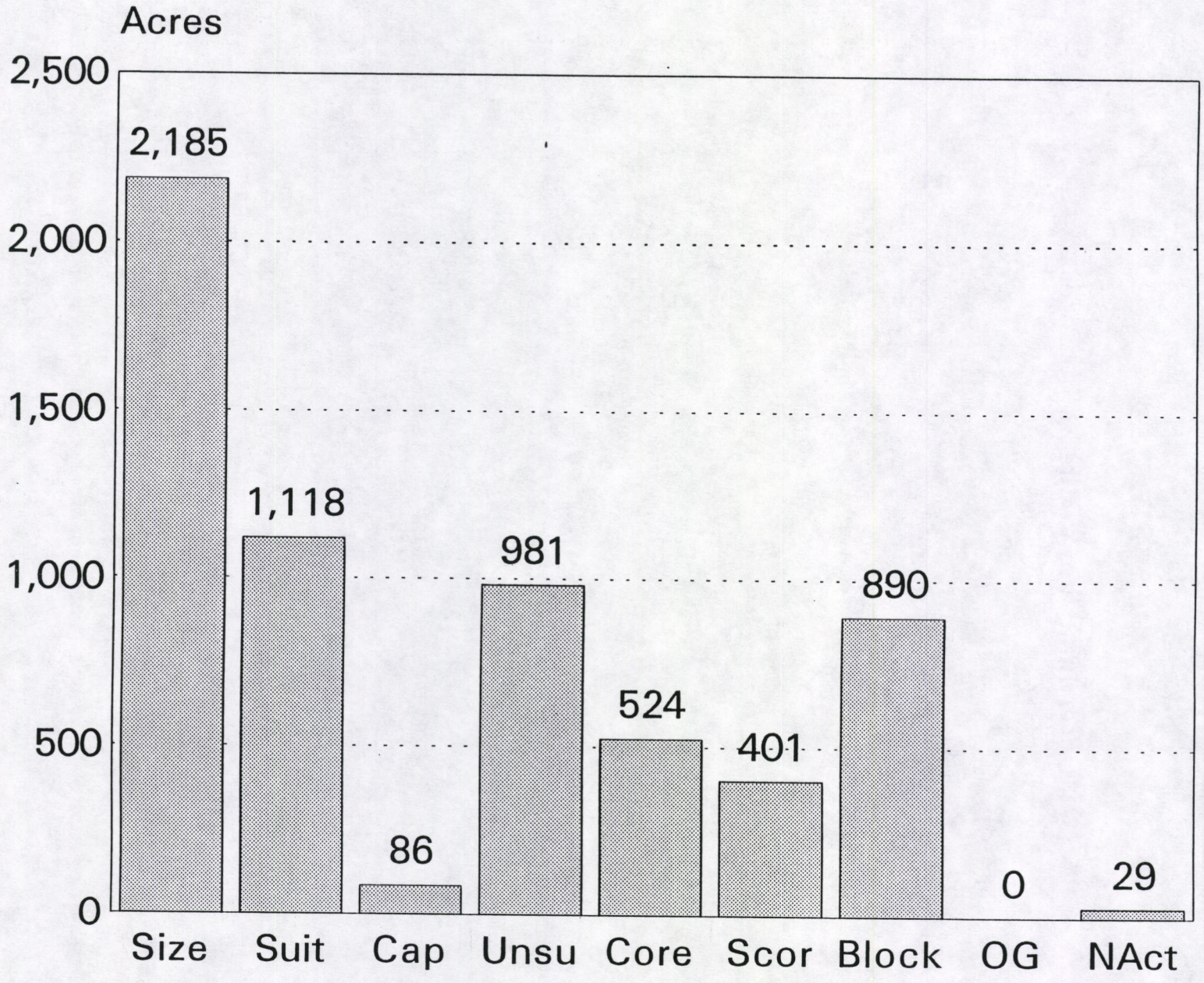

Figure A12. Mean Characteristics of 34 Mexican spotted owl Management Territories (MT) on the Tonto National Forest in Arizona.

APPENDIX B

Determination of Effects by Forest

Apache-Sitgreaves National Forests

Eight Category 1 and four Category 3 actions are proposed in ponderosa pine and mixed conifer habitat types (Table B1). Most Category 1 projects occur outside HMAs and no suitable habitat is proposed for treatment. The Category 3 projects occur in HMA 3 (Table B2) and modify about 808 acres of suitable habitat. Projects will not modify suitable owl habitat within HMAs 1 (37 MTs) or 2 (5 MTs) on the Chevelon, Heber, Springerville and Alpine Ranger Districts.

Proposed activities would modify suitable habitat within 6 of 38 MTs in HMA 3 (Table B3). Of approximately 176,872 acres of suitable habitat within HMA 3, proposed projects would alter, through a variety of treatments, some 808 acres (0.5 percent). Three MTs within HMA contain less than the recommended suitable habitat acres (Table B3); however, none will be affected by the proposed activities. The high density of MTs has likely served to retain substantial options for application of a Mexican spotted owl conservation strategy on the Forest.

Effects of the projects and resultant 0.5 percent reduction in suitable habitat are not considered substantial because of the high densities of owls and good reproduction.

Carson National Forest

Proposed actions affect unoccupied suitable and capable owl habitat and do not affect MTs. No actions are proposed in owl management territories or HMAs. Five Category 2 projects affect a total of 143 acres of suitable habitat and four Category 3 projects affect between 1,975 and 2,615 acres of suitable habitat proposed on Carson National Forest (Table B4).

Proposed actions would not affect this area's suitability or distribution of spotted owls in the Carson National Forest part of the range. MTs on Carson National Forest contain well over the minimum amount of recommended suitable habitat. The MTs and HMA on Carson National Forest will not be affected. Some unoccupied, but apparently suitable habitat will be modified. This habitat's suitability needs further examination. Large amounts of this suitable habitat will remain. Reproduction in this part of the range appears to be low.

Cibola National Forest

Twelve Category 1, three Category 2, and one Category 3 actions are proposed in ponderosa pine and mixed-conifer habitats, with a total of 290 acres of suitable habitat proposed for treatment (Table B5). These activities fall within or adjacent to HMAs 1, 2, and 4 (Table B2). No habitat-modifying activities are proposed within HMAs 3, 5, 6, or 7.

On Cibola National Forest, 1992 actions would modify 58 acres of suitable habitat within and 222 acres of suitable habitat adjacent to two of seven HMAs. One HMA on the Cibola has three MTs that have fewer than 1,000 acres of suitable habitat. Proposed actions would not reduce the suitable habitat within these three MTs but some capable habitat would be delayed in reaching suitable condition.

The Mirabal, Alamosa, and Sawyer Timber Sales are mostly within HMA 1. The Mirabal and Sawyer sales will not affect suitable owl habitat. The proposal for the Alamosa sale is to regenerate a 10-acre aspen stand within two overlapping MTs. These proposed actions would occur within three MTs identified as having less than 1,000 acres of suitable habitat (Table A3). Treatments within 030206 or 030208 will not affect suitable or capable habitat. Treatment of habitat in 030207 will not affect suitable habitat but will affect 79 acres of capable habitat and extend the time-frame to attain suitable habitat condition.

HMA 2 does not have activities proposed within the HMA. The Spudpatch Timber Sale would modify about 222 acres of suitable habitat adjacent to this HMA.

Nine Category 1 and one Category 2 actions proposed within HMA 4 would modify a total of 58 acres of suitable habitat (Table A2).

The Rincon Timber Sale is planned between HMA 1 and 7. No suitable habitat will be affected.

Private land logging and other actions may significantly reduce or eliminate owl pairs that may exist in canyons adjacent to Forest lands.

Effects of the 92 actions appear to be substantial. The total acreage figure to be modified is relatively low, 280 acres of suitable habitat lost. However, because of the low occupancy and reproductive problems any loss of suitable habitat is unacceptable.

Coconino National Forest

Nineteen Category 1, two Category 2, and four Category 3 actions are proposed in ponderosa pine, pine/oak, mixed conifer, and pinyon-juniper habitat types (Table B7). Most Category 1 projects occur outside HMAs and do not modify suitable owl habitat. Category 2 and 3 projects occur in HMAs 2, 3, 4, and 5 (Table B2) and modify some 1,907 acres of suitable habitat (Table B7). Suitable habitat within HMAs 1 (1 MT), 6 (4 MTs), and 7 (20 MTs) on the Peaks, Mormon Lake, and Long Valley Ranger Districts, respectively, will be unaffected by 1992 actions. Proposed actions will modify suitable owl habitat within three of the four remaining HMAs.

HMA 2 has 8 MTs, 3 of which share one activity proposed in suitable habitat. This HMA has 5,783 acres of mapped suitable habitat. The proposed project will modify 5 acres (0.08 percent) of the suitable habitat in the HMA (through a sanitation harvest).

HMA 3 has 24 MTs, three of which have impacts expected from 1992 actions. Based on known suitable habitat in the MTs, there are at least 35,129 acres of suitable habitat within the HMA (preliminary GIS mapping indicates that there are only 7,270 acres of suitable habitat within the HMA). There are 765 acres (2.2 percent) of suitable habitat proposed for treatment. This HMA overlaps with HMA 1 on Kaibab National Forest in which one activity, modifying 50 acres of suitable habitat, is proposed.

HMA 4 has 2 MTs. One 92 action is proposed in this HMA but no treatments are proposed in suitable habitat.

Suitable habitat within nine of the 27 MTs within HMA 5 will be modified by proposed 92 actions. There are approximately 31,355 acres of suitable habitat within the HMA, 770 acres (2.4 percent) of which are proposed for treatment.

The Merritt Timber Sale is proposed within HMA 7, which contains 20 MTs and 17,284 acres of suitable habitat. No suitable habitat will be modified by this project.

The MTs with 1992 actions (Table 13) average 1,390 acres of suitable habitat before treatments and 1,279 acres after treatment. The four MTs that contain less than the recommended suitable habitat acreage will not be affected by the proposed activities.

The 92 activities will result in less than 2 percent reduction in suitable habitat across the forest. This is not expected to be substantial as the population is stable with high densities of owl with good reproduction.

Coronado National Forest

HMAs 1-5, 7, 9, and 10 will have no 1992 activities affecting suitable habitat. They have 2,997 acres (1 MT); 12,402 acres (8 MTs); 5,838 acres (1 MT); 73,192 acres (9 MTs); 4,710 acres (1 MT); 27,043 acres (3 MTs); 5,506 acres (2 MTs); 74,443 (11 MTs) respectively.

Coronado National Forest has proposed only two projects in suitable habitat totaling about 51 acres in several territories (Tables B2, B9, and B10).

These actions are not expected to detrimentally affect the contribution this HMA provides to the Regionwide owl population because of the insignificant (0.09 %) change in the amount in suitable habitat across the forest.

Gila National Forest

The Gila National Forest has nine FY 1992 Category 1 actions (Table B11) proposed in ponderosa pine and mixed-conifer habitats types. HMAs 1, 3, and 6 will be affected by the proposed activities (Table B2) but no suitable habitat will be modified. The remaining HMAs 2, 4, 5, 7, 8, and 9 will not be affected by the proposed activities.

HMA 1 contains four MTs and 2,546 acres of suitable habitat. The activities proposed in HMA 1, including Twin, Spring, and Southfork Timber Sales, would not affect suitable habitat, but capable habitat will be modified. They will lengthen the time needed for the habitat to attain suitable habitat condition. These MTs are currently below the Regional guideline of providing a minimum of 1,000 acres of suitable habitat (Table B12).

HMA 3 contains 16 MTs and 8,188 acres of suitable habitat. Two timber sales, Lily and Swap Booth, are proposed within it. Neither would modify suitable owl habitat, but capable

habitat will be modified. This will lengthen the time needed for capable to attain suitable habitat condition. Acreage figures of MTs are not available for all MTs near these projects. Those that are available do not meet the current Regional direction to provide for a minimum of 1,000 acres of suitable habitat.

The Rocker, Bull Pasture, and Burnt Cabin Timber Sales are proposed within HMA 6. No modification of suitable owl habitat is proposed but capable habitat will be modified and lengthen the time needed to attain suitable habitat conditions. This HMA contains 49 management territories and about 24,367 acres of suitable habitat. About half of the MTs near these activities have less than 1,000 acres of suitable habitat. The MTs near the Rocker Timber Sale average 699 acres of suitable habitat. The MTs near the Bull Pasture Sale average 1,438 and those adjacent to the Burnt Cabin average 442 acres of suitable habitat.

No suitable habitat will be modified, therefore, direct effects to owls and their habitat are not considered substantial. However, reproduction for this forest is low and therefore projects should be evaluated to determine if capable could be accelerated toward attaining suitability.

Kaibab National Forest

Seven Category 1 and one Category 2 projects are proposed in ponderosa pine and mixed-conifer vegetation types (Table B13). Only the Mesa Timber Sale will occur within owl habitat. HMA 1 with a total of 37,260 acres and one MT on Williams Ranger District will be unaffected by projects.

The Mesa Timber Sale is within HMA 2 (Table B2), which contains two MTs and 6,056 acres of suitable habitat. The proposed project will modify approximately 50 acres (0.8 percent) of suitable habitat. This HMA is adjacent to HMA 3 on the Coconino NF where three proposed projects would modify 765 acres of suitable habitat.

The effects of the 92 actions on the Kaibab National Forest are not considered significant with 0.89 percent suitable habitat modified in HMA 2. The percent of suitable habitat modified on the entire forest is considerably less.

Lincoln National Forest

There are 13 proposed projects, five Category 1, four Category 2, and four Category 3 (Table B11). A total of 1,541 acres of suitable habitat will be modified. Habitat within both HMAs will be affected (Table B2).

HMA 1 contains 13 MTs and about 13,183 acres of suitable habitat. The Gavilan vegetation manipulation project is the only project planned within this HMA. No suitable habitat will be affected by this project. Only one MT is near this project. It has 1,440 acres of suitable habitat and will not change as a result of this project.

HMA 2 contains 92 MTs and some 143,909 acres of suitable habitat. One Category 1, one Category 2, and four Category 3 projects affect this HMA. A total of 1,534 acres (1.19 percent) of suitable habitat will be modified. Thirty-one MTs will be affected (Table B15). These 31 MTs average 1,516 acres of suitable habitat and all average more than the current Regional minimum requirement of 1,000 acres of suitable habitat.

Effects of the projects and resultant 1.19 percent reduction in suitable habitat are not considered substantial because of the high densities of owls and good reproduction.

Prescott National Forest

Prescott National Forest has one HMA with 17,230 acres of suitable habitat and 8 MTs. No projects are proposed in or adjacent to suitable owl habitat. Therefore, there are no effects to owls or their habitat.

Santa Fe National Forest

Two Category 1, seventeen Category 2, and six Category 3 activities are proposed in ponderosa pine and mixed-conifer habitat types (Table B16). A total of 8,075 acres of suitable habitat will be treated. All acres lie either entirely or partially within HMAs 2, 3, 4, 6, and 7 (Table B2). The other two HMAs do not have activities proposed that would modify suitable habitat. Five of the activities do not fall within any HMA but suitable habitat is proposed for treatment. The Forest MTs average 1,675 acres of suitable habitat and will not change as a result of the proposed actions. HMAs currently average 37,619 acres of suitable habitat and will retain an average of 36,465 acres of suitable habitat after treatment.

HMA 2 has 2 MTs and 19,958 acres of suitable habitat. There are two activities proposed within this HMA. The Canyon de Ojito Timber Sale has no suitable habitat proposed for treatment. However, 738 acres (3.2 percent) of suitable habitat are proposed for treatment under the Cero Pavo Timber Sale. Treatments include group selection, intermediate, and special prescriptions.

HMA 3 has 5 MTs and 37,481 acres of suitable habitat. Six activities are proposed within this HMA and will modify 968 acres (2.6 percent) of the suitable habitat.

HMA 4 has 7 MTs and 73,798 acres of suitable habitat. There are 6 activities proposed within this HMA. The activities will modify 1,056 acres (1.4 percent) of suitable habitat. Group selection and intermediate cuts are the proposed treatments.

HMA 6 has two MTs and 7,436 acres of suitable habitat. There are two activities proposed that would modify 20 acres (0.3 percent) of suitable habitat. Proposed treatments include intermediate and final removal cuts.

HMA 7 has 5 MTs and 45,899 acres of suitable habitat. Three activities are proposed within this HMA. Ninety-one acres (0.2 percent) of suitable habitat are proposed for a final removal treatment.

Effects of the 92 actions, as proposed, appear to be substantial. Five of the seven HMAs would have between 0.2- and 3.2-percent decreases in suitable habitat. In addition suitable habitat outside of HMAs that would be modified to capable habitat. However, all of the MTs in these HMAs have well over the 1,000-acre minimum of suitable habitat.

Tonto National Forest

Eight 1992 actions, four Category 1 and four Category 3 activities are proposed in ponderosa pine and mixed-conifer habitat types (Table B17). Four occur in HMAs 4 and 5 (Table B2) and modify about 410 acres of suitable habitat. Five HMAs (1, 2, 3, 6, and 7) will not be affected by 1992 actions (Pleasant Valley, Tonto Basin, and Globe Ranger Districts).

HMA 4 contains 2 MTs. One has suitable habitat that would be modified by proposed 1992 projects. There are 38,341 acres of suitable habitat within this HMA. The proposed project will alter 45 acres (0.1 percent) of suitable habitat in the HMA through a sanitation harvest. One MT in this HMA does not meet the 1,000 acres regional minimum of suitable habitat (Table B18).

HMA 5 has 22 MTs, 6 have activities proposed in suitable habitat. Two (120401 and 120505) (Table B18) do not have 1,000 acres of suitable habitat will not harvest suitable habitat within the MT boundaries. There are 40,636 acres of suitable habitat within this HMA with 328 suitable habitat acres (0.8 percent) proposed for treatment. This HMA overlaps with HMA 1 on Apache-Sitgreaves National Forests in which no activities are proposed. HMA 5 on the Tonto and HMA 1 on the Apache-Sitgreaves each have more than 20 pairs per HMA.

Effects of the 92 actions are not considered significant because there will less than 0.5 percent reduction in suitable habitat and the MTs modified in 1992 actions include an average of 1,374 acres of suitable habitat; reduced to approximately 1,315 (average) acres after treatments. This is well above the 1,000 acre regional minimum.

Table B1. Conference category; name; habitat type; acres modified, volume harvested (MBF); percent of acreage modified in suitable Mexican spotted owl habitat; suitable acres affected; and, numbers of all Management Territories the activity would occur in for each proposed management activity on the **Apache-Sitgreaves National Forest** in Fiscal Year 1992.

CATEGORY NUMBER	NAME	HABITAT TYPE	ACRES MODIFIED	VOLUME HARVESTED	PERCENT MSO	SUITABLE ACRES AFFECTED	TERRITORY NUMBER
1	Colbath	PP	413	710	0	None	
	Promontory	PP	1253	1440	0	None	
	Lons	PP	?	?	0	None	No Hab Present
	Bagnal	PP	?	?	0	None	No Hab Present
	Lincoln	PP	185	275	0	None	No Hab Present
	St. Joe	PP	2163	7920	0	None	
	Elk	PP	?	?	0	None	Suitable Present; No Treatments Proposed In It.
	Duran	PP	1745	3900	0	None	010414, 010415
3	Hagen	MC	880	5220	22	194	010135,010136
	North Fork	MC	1520	4200	<10	152	010603
	OD Ridge	MC	2399	6000	<10	239	010112
	Bearcat	PP	2024	7500	11	223	None

Table B2. HMAs affected by proposed 92 projects.

HMA	Total Acres	Ranger District	Number of MTs	Proposed Projects Modifying Habitat
Apache-Sitgreaves NFs				
3	317,837	Alpine	38	Hagen, Northfork, OD Ridge, Bearcat
Cibola NF				
1	73,991	Mount Taylor	7	Sawyer, Mirabal, Alamosa
4	34,762		2	New Canyon Trail, Red Canyon Trailhead, Trigo Canyon Trail, Ox Canyon Trailhead, Spruce Spring Reconstruction, Sand Spring Reconstruction, Pine Shadow Trailhead, Road 253 Reconstruction, Box Spring Reconstruction
Coconino NF				
2	110,051	Peaks	8	Transwestern Pipeline, El Paso Pipeline, Lateral Pipeline, Marshill
3	143,738	Peaks, Sedona	24	Fry/Peaks Small Sale, Redhill TS
5	164,108	Long Valley, Mormon Lake	27	Bar M TS, Mud MP, 93 Thinning Project
7	144,915	Blue Ridge	20	U-Bar TS, Merritt TS
Coronado NF				
6	74,443	Santa Catalina	15	Mt. Lemmon Hwy.
8	109,381	Safford	26	Twilight Campground
Gila NF				
1	124,632	Quemado (A/S)	4	Spring TS, Twin TS
3	117,968	Luna, Reserve	16	Swap Booth, Lily
6	125,430	Glenwood, Reserve, Wilderness	49	Rocker, Burnt Cabin Bull Pasture
Kaibab NF				
2	47,713	Chalender	1	Mesa TS
Lincoln NF				
1	72,516	Smokey Bear	8	Gavilan Veg. Manipulation
2	279,887	Cloudcroft, Mayhill	95	Perk/Pepper, Bird, Hay, and Dry Canyon Timber Sales; Lucas, Canyon, Willie White, and Rim Trail Maintenance, Bailey Canyon Road Relocation, Thinnings, Dwarf Mistletoe Control, Aspen Management.
Santa Fe NF				
2	56,711	Coyote, Espanola	2	Cero Pavo, Canada de Ojitos
3	68,741	Cuba, Jemez	5	Pinabetal, Willow, Calaveras, Seven Springs, Middlefork, South Ojitos
4	146,867	Jemez	7	Middlefork, South Ojitos, Spring I-5, Guadalupe, Bales, Navajo/Deer
6	41,489	Pecos/Las Vegas	2	Paddy, Saaz
7	120,021	Pecos/Las Vegas	5	Tumwater, Lucky, Sandman
Tonto NF				
4	105,226	Payson	2	Wooffidd TS
5	103,457	Payson, Pleasant Valley	22	Ashmo TS, Crouch TS, Rose TS

Table B3. Mexican spotted owl (MSO) Management Territory (MT) Number, total acreage, amount of suitable, capable and unsuitable habitat, size of the core area, amount of suitable habitat in the core area, size of the largest contiguous block of suitable habitat, amount of old growth present and the acreage of new activities in MSO habitat for activities proposed on the **Apache-Sitgreaves National Forests** in Fiscal Year 1992.

MANAGEMENT TERRITORY NUMBER	SUITABLE HABITAT	CAPABLE HABITAT	UNSUITABLE HABITAT	MANAGEMENT TERRITORY SIZE	CORE SIZE	SUITABLE IN CORE	OLD GROWTH	BLOCK OF SUITABLE	NEW ACTIVITIES
010135	1905	22	117	2044	441	441	0	1905	22
010136	2049	96	0	2145	465	465	0	2049	96
010603	1707	375	21	2103	450	450	0	1717	6
010112	1253	740	14	2007	525	525	350	525	0
010414	597	1023	390	2010	450	200	597	580	161
010415	171	1727	107	2005	479	150	30	100	0

Table B4. Conference category; name; habitat type; acres modified, volume harvested (MBF); percent of acreage modified in suitable Mexican spotted owl habitat; suitable acres affected; and, numbers of all Management Territories the activity would occur in for each proposed management activity on the **Carson National Forest** in Fiscal Year 1992.

CATEGORY NUMBER	NAME	HABITAT TYPE	ACRES MODIFIED	VOLUME HARVESTED	PERCENT MSO	SUITABLE ACRES AFFECTED	TERRITORY NUMBER
2	Pine/Fir Firewood	PP	35	75	0	None	None
	Dorado PP FY92	PP	100	50	0	None	None
	Bolo FY92	PP	129	321	15	19	None
	Alamo/Dinner	PP/MC	100	200	0	None	None
	Spring FY92	PP/MC	228	400	50	114	None
3	Little Tusas FY92	MC/PP	360	600	100	360	None
	Felipito FY92	MC/PP	660-1,300 {1}	3500 - 6680 {1}	100	660-1,300	None {2}
	Dulce FY92	PP/MC	1061	3000	90	955	None
	Ojos/Ryan FY92	SF/MC	{3}	{3}	{3}	{3}	None

{1} Figures are from the Filipito Draft EIS. Final will be available 7/15/92

{2} Filipito had 3 years of Spotted owl surveys.

{3} Information for Ojos/Ryan is unavailable at this time. This project is in the early NEPA stages. The alternatives exist in conceptual form only at this time.

Table B5. Conference category; name; habitat type; acres modified, volume harvested (MBF); percent of acreage modified in suitable Mexican spotted owl habitat; suitable acres affected; and, numbers of all Management Territories the activity would occur in for each proposed management activity on the **Cibola National Forest** in Fiscal Year 1992.

CATEGORY NUMBER	NAME	HABITAT TYPE	ACRES MODIFIED	VOLUME HARVESTED	PERCENT MSO	SUITABLE ACRES AFFECTED	TERRITORY NUMBER
1	Mirabal FY92	PP/MC	1017	1250	0	None	030201 030207 030208
	Rincon FY92	PP/MC	1700	2520	0	None	
	New Canyon Trail - FY92		0	0	0	None	
	Red Canyon Trailhead - FY92		0	0	0	None	030401
	Trigo Canyon Trail - FY92		0	0	0	None	
	Ox Canyon Trailhead - FY92		1	1	100	1	030402
	Spruce Spring Reconstruction FY92		1	1	100	1	
	Sand Spring Reconstruction FY92		1	1	100	1	
	Pine Shadow Trailhead FY92		2	2	100	2	
	Road 253 Reconstruction FY92	-	3	3	100	3	030401

CATEGORY NUMBER	NAME	HABITAT TYPE	ACRES MODIFIED	VOLUME HARVESTED	PERCENT MSO	SUITABLE ACRES AFFECTED	TERRITORY NUMBER
	Box Spring Reconstruction FY92	-	0	0	0	None	030401
	Alamosa FY92	-	1025	1400	<1	10	030204 030205
2	Red Canyon Campground FY92	-	50	0	100	50	030401
	Sawyer FY92 (DN FY90)	-	452	941	0	0	030206 030209
	Indian Spring Burn FY93	-	800	0	20	No Change in Suitability	
3	Spudpatch FY93 (Alternatives are incomplete)	-	1171	4632	19	222	

Table B6. Mexican spotted owl (MSO) Management Territory (MT) Number, total acreage, amount of suitable, capable and unsuitable habitat, size of the core area, amount of suitable habitat in the core area, size of the largest contiguous block of suitable habitat, amount of old growth present and the acreage of new activities in MSO habitat for activities proposed on the **Cibola National Forest** in Fiscal Year 1992.

MANAGEMENT TERRITORY NUMBER	SUITABLE HABITAT	CAPABLE HABITAT	UNSUITABLE HABITAT	MANAGEMENT TERRITORY SIZE	CORE SIZE	SUITABLE IN CORE	OLD GROWTH	BLOCK OF SUITABLE	NEW ACTIVITIES
030201	630	298	642	1570	908	420	0	420	0
030207	450	293	1127	1870	375	375	0	450	0
030208	637	397	1013	2047	426	375	0	500	0
030401	1809	136	55	2000	450	450	1028	1789	50
030402	1967	237	0	2204	450	450	400	1967	5
030401	1809	136	55	2000	450	450	1028	1789	50
030401	1809	136	55	2000	450	450	1028	1789	50
030401	1809	136	55	2000	450	450	1028	1789	50
030204	534	0	1196	1730	510	450	-	-	0
030205	975	588	667	2230	612	612	-	-	0
030209	832	0	1284	2116	460	320	-	-	0
030206	575	0	1700	2275	565	450	-	-	0
030209	832	0	1284	2116	460	320	-	-	0

Table B7. Conference category; name; habitat type; acres modified, volume harvested (MBF); percent of acreage modified in suitable Mexican spotted owl habitat; uitable acres affected; and, numbers of all Management Territories the activity would occur in for each proposed management activity on the **Coconino National Forest** in Fiscal Year 1992.

CATEGORY NUMBER	NAME	HABITAT TYPE	ACRES MODIFIED	VOLUME HARVESTED	PERCENT MSO	SUITABLE ACRES AFFECTED	TERRITORY NUMBER
1	Transwestern Pipeland	MC	5	5	100	5	040206,040207, 040208;
	Bray Salvage	MC	180	600	0	None	None
	Immigrant	MC	1888	9300	0	None	None
	Banilon TSI	PP	801	250	0	None	None
	Anchor	PP	1408	3000	0	None	None
	Dirtyneck	PP	1944	5300	0	None	None
	Lake	PP	2140	6000	0	None	None
	Valley MP	PP	4800	2500	0	None	None
	LeBarron	PP/P0	4089	15600	0	None	None
	AZ Trail	-	0	0	0	None	040501
	Trail Main-tenance	-	0	0	0	None	040605
	Pine Flat Campground	-	1	1	100	1	None
	1992 Malapais	-	3470	8300	0	None	None
	Monument	-	3712	2000	0	None	None
	Seep Burn	PO	701	0	0	None	None
	Strawberry	-	4965	2000	0	None	None

CATEGORY NUMBER	NAME	HABITAT TYPE	ACRES MODIFIED	VOLUME HARVESTED	PERCENT MSO	SUITABLE ACRES AFFECTED	TERRITORY NUMBER
	Apache Maid	PP/PO/PJ	300	400	0	None	None
	Mortgage MP	MC/PO	-	-	0	None	040509,040512, 040515;
2	Fry/Peaks Small Sale	PP/PO	204	282	100	204	040214
	U-Bar	MC/PP	1691	6,000	10	168	None
3	Bar-M	PO	2327	11,800	15	349	040506, 040516, 040517, 040518, 040521, 040527, 040528, 040529
	Mud MP	PO	956	2,758	44	425	040525
	Buckhead	PP/PO	974	8300	26	253	040220
	Red Hill	PP/PO	3859	8900	8	308	040212
	Merritt	MC/PP	1617	7055	12	194	None
	Dairy Thinning	MC/PO	-	-	-	Precommercial Thin	040507, 040508, 040511, 040531

Table B8. Mexican spotted owl (MSO) Management Territory (MT) Number, total acreage, amount of suitable, capable and unsuitable habitat, size of the core area, amount of suitable habitat in the core area, size of the largest contiguous block of suitable habitat, amount of old growth present and the acreage of new activities in MSO habitat for activities proposed on the **Coconino National Forest** in Fiscal Year 1992.

MANAGEMENT TERRITORY NUMBER	SUITABLE HABITAT	CAPABLE HABITAT	UNSUITABLE HABITAT	MANAGEMENT TERRITORY SIZE	CORE SIZE	SUITABLE IN CORE	OLD GROWTH	BLOCK OF SUITABLE	NEW ACTIVITIES
040206	2021	47	110	2178	689	689	0	2021	0
040207	1629	391	0	2021	450	450	0	1629	391
040208	2123	113	0	2236	641	634	0	2123	0
040525	1292	735	61	2088	491	491	0	1292	0
040501	1302	515	0	1817	543	543	441	1303	272
040605	851	414	127	1392	502	375	109	851	0
040509	1729	268	32	2029	444	444	59	1729	0
040512	855	981	192	2028	461	250	0	400	0
040515	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
040214	1490	479	68	2037	534	487	245	1490	0
040506	1355	658	20	2033	465	465	214	1200	0
040516	1640	357	118	2115	461	420	38	1640	0
040517	1393	586	128	2107	516	450	222	1393	0
040518	1002	782	274	2058	453	440	66	1002	0
040521	758	1284	99	2141	512	300	0	300	0
040527	185	1876	0	2061	483	100	0	100	0
040528	292	1769	6	2067	488	250	0	175	0
040529									
040220	1512	433	2	1947	475	475	605	1512	273
040212	1651	400	8	2059	491	491	0	1651	199
040507	-	-	-	-	-	-	-	-	-
040508	1492	567	0	2059	456	456	-	-	567
040511	1032	1011	0	2043	453	225	-	-	1011
040531	-	-	-	-	-	-	-	-	-

Table B9. Conference category; name; habitat type; acres modified, volume harvested (MBF); percent of acreage modified in suitable Mexican spotted owl habitat; suitable acres affected; and, numbers of all Management Territories the activity would occur in for each proposed management activity on the **Coronado National Forest** in Fiscal Year 1992.

CATEGORY NUMBER	NAME	HABITAT TYPE	ACRES MODIFIED	VOLUME HARVESTED	PERCENT MSO	SUITABLE ACRES AFFECTED	TERRITORY NUMBER
2	Mt. Lemmon Hwy	MC/PP	23.2	25	100	23.2	0505001, 0505004, 0505005, 0505006, 0505007, 0505008, 0505009;
	Twilight Campground	PP	28	10	100	28	0504021

Table B10. Mexican spotted owl (MSO) Management Territory (MT) Number, total acreage, amount of suitable, capable and unsuitable habitat, size of the core area, amount of suitable habitat in the core area, size of the largest contiguous block of suitable habitat, amount of old growth present and the acreage of new activities in MSO habitat for activities proposed on the **Coronado National Forest** in Fiscal Year 1992.

MANAGEMENT TERRITORY NUMBER	SUITABLE HABITAT	CAPABLE HABITAT	UNSUITABLE HABITAT	MANAGEMENT TERRITORY SIZE	CORE SIZE	SUITABLE IN CORE	OLD GROWTH	BLOCK OF SUITABLE	NEW ACTIVITIES
0505010	172	0	1828	2000	450	150	0	172	2.1
0505014	1822	169	9	2000	450	450	376	1822	0.1
0505005	1224	486	290	2000	450	450	30	1224	1.8
0505006	888	175	937	2000	450	200	220	300	10.3
0505007	673	375	952	2000	450	200	0	600	10.2
0505008	1062	152	786	2000	450	400	0	1025	1.8
0505009	1370	4	626	2000	450	425	290	1370	5.8
0504021	1246	1272	303	2821	1100	1000	0	1150	0

Table B11. Conference category; name; habitat type; acres modified, volume harvested (MBF); percent of acreage modified in suitable Mexican spotted owl habitat; suitable acres affected; and, numbers of all Management Territories the activity would occur in for each proposed management activity on the **Gila National Forest** in Fiscal Year 1992.

CATEGORY NUMBER	NAME	HABITAT TYPE	ACRES MODIFIED	VOLUME HARVESTED	PERCENT MSO	SUITABLE ACRES AFFECTED	TERRITORY NUMBER
1	El Caso	PP	3173	3000	0	None	
	Swap Booth	PP	4142	5300	0	None	0603010, 0603011, 0603012;
	South Fork	PP	549	600	0	None	0606033
	Spring	PP	1922	2200	0	None	0609003, 0609004;
	Burnt Cabin	PP	2725	6800	0	None	0606033, 0606034, 0606035, 0606036, 0606037, 0606038;
	Twin FY 93	PP/MC (1)	?	?	0	None	0609001 (2)
	Lily	PP/MC (1)	?	?	0	None	0603013, 0603014 0603015, 0603019, 0603004 (3) (4)
	Rocker	PP/MC (1)	?	?	0	None	0606033, Rocker #7, 0606004, 0606006, 0606005, 0606023, and 0606019 (3)
	Bull Pasture	PP/MC (1)	?	?	0	None	0604001, 0604002, 0604003, 0604004, 0604005, 0604006, 0604007, 0604018, 0604019, 0604020, 0606004, 0604008, 0604012 (3)

(1) Project is only in preliminary planning stages-no concrete alternatives nor recommended alternative available
(2) Even under an alternative that emphasizes harvesting timber, only a max. of app. 80 acres of "capable " MSO would be involved. No suitable being proposed for modification.
(3) None of the current alternatives propose to modify "suitable" MSO habitat. Proposed activity will occur in "capable" MSO habitat.
(4) New data collected during MSO formal monitoring may indicate a need to develop an additional MT just to the south of, and potentially including a portion of the southern section of Lily TS. Insufficient data at this time to justify new MT delineation.
(5) Listing of MT's potentially involved in proposed activity were based upon 2000 acre territories. The Gila NF is under the direction to implement the MSO mgmt. guidelines using a 1500 acre management territory.

Table B12. Mexican spotted owl (MSO) Management Territory (MT) Number, total acreage, amount of suitable, capable and unsuitable habitat, size of the core area, amount of suitable habitat in the core area, size of the largest contiguous block of suitable habitat, amount of old growth present and the acreage of new activities in MSO habitat for activities proposed on the **Gila National Forest** in Fiscal Year 1992.

MANAGEMENT TERRITORY NUMBER	SUITABLE HABITAT	CAPABLE HABITAT	UNSUITABLE HABITAT	MANAGEMENT TERRITORY SIZE	CORE SIZE	SUITABLE IN CORE	OLD GROWTH	BLOCK OF SUITABLE	NEW ACTIVITIES
0609001	673	1314	315	2302	757	575	0	636	0
0603010	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
0603011	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
0603012	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
0606033	550	1374	93	2017	450	450	0	500	194
0606034	450	1519	31	2000	450	225	100	150	492
0606035	600	1349	51	2000	554	250	200	400	36
0606036	400	1522	110	2032	450	80	86	150	14
0606037	200	1832	8	2040	450	180	200	200	43
0606038	450	1402	184	2036	450	150	300	200	303
0609003	631	871	595	2097	569	450	374	398	40
0609004	409	1443	209	2061	634	300	0	240	0
0606033	550	1374	93	2017	450	450	0	500	194
0603004	900	300	800	2000	450	-	900	900	200
0603013	600	900	500	2000	450	-	300	550	0
0603014	850	200	950	2000	450	-	200	550	0
0603015	600	1000	400	2000	450	-	100	450	0
0603019	881	1176	96	2153	648	-	-	881	0
0606003	859	1159	0	2018	450	450	-	-	341
0606004	679	1350	35	2064	649	500	-	-	114
0606005	719	1238	23	1980	460	325	-	-	77
0606006	614	1336	50	2000	450	225	-	-	386
0606019	550	125	1325	2000	450	450	-	-	0
0606023	775	1075	150	2000	450	125	-	-	125
Rocker #7	-	-	-	-	-	-	-	-	-

MANAGEMENT TERRITORY NUMBER	SUITABLE HABITAT	CAPABLE HABITAT	UNSUITABLE HABITAT	MANAGEMENT TERRITORY SIZE	CORE SIZE	SUITABLE IN CORE	OLD GROWTH	BLOCK OF SUITABLE	NEW ACTIVITIES
0604001	1716	286	0	2002	503	450	-	-	286
0604002	1328	660	44	2032	450	225	-	-	660
0604003	1785	239	13	2037	467	467	-	-	239
0604004	1434	578	105	2117	650	450	-	-	578
0604005	808	890	334	2032	570	300	-	-	890
0604006	1596	404	0	2000	468	375	-	-	404
0606007	1585	491	0	2076	450	450	-	-	491
0604008	1457	564	14	2035	493	400	-	-	564
0604012	1301	375	114	2018	456	250	-	-	603
0604018	1989	64	7	2060	577	577	-	-	64
0604019	1419	700	0	2119	530	250	-	-	700
0604020	1604	385	0	2024	456	375	-	-	385
0606004	679	1350	35	2064	649	500	-	-	1350

Table B13. Conference category; name; habitat type; acres modified, volume harvested (MBF); percent of acreage modified in suitable Mexican spotted owl habitat; suitable acres affected; and, numbers of all Management Territories the activity would occur in for each proposed management activity on the **Kaibab National Forest** in Fiscal Year 1992.

CATEGORY NUMBER	NAME	HABITAT TYPE	ACRES MODIFIED	VOLUME HARVESTED	PERCENT MSO	SUITABLE ACRES AFFECTED	TERRITORY NUMBER
1	McDermit	PP	400	800	0	None	None
	Brannigan	PP	750	2500	0	None	None
	Lookout Canyon	PP	NA	3000	0	None	None
	Jack/Jolly	PP	NA	6000	0	None	None
	Burntsaddle	PP	NA	10000	0	None	None
	Big Burrow	PP	NA	NA	0	None	None
	Paris/Stina	PP/MC	NA	NA	0	None	None
2	Mesa	PP	1657	4200	3	50	None

Table B14. Conference category; name; habitat type; acres modified, volume harvested (MBF); percent of acreage modified in suitable Mexican spotted owl habitat; suitable acres affected; and, numbers of all Management Territories the activity would occur in for each proposed management activity on the **Lincoln National Forest** in Fiscal Year 1992.

CATEGORY NUMBER	NAME	HABITAT TYPE	ACRES MODIFIED	VOLUME HARVESTED	PERCENT MSO	SUITABLE ACRES AFFECTED	TERRITORY NUMBER
1	Lucas Cyn Tr. Maintenance (FY92 or 93)	MC	1-2	0	100	1-2	
	Willie White Tr Maintenance (FY92)	MC	1-2	0	100	1-2	080225
	Rim Trail Maintenance (FY92)	MC	1-2	0	100	1-2	
	Bailey Canyon Road (FY92)	MC/PP	3	0	100	3	080213,080240
2	Dwarf Mistletoe Control (FY92)	MC/PP	83			In preparation	Unknown at this time
	Aspen Mgt (FY92)	Aspen	25	0	0		
	Gavilan Veg Manipulation (FY92)	PP	100	0	0	None	080101
	Thinning (FY92)	MC	255	0	0	None	None
3	Perk/Pepper (FY92)	MC	375	985	100	375	080411, 080435, 080438, 080455; 080456, 080459, 080498;

CATEGORY NUMBER	NAME	HABITAT TYPE	ACRES MODIFIED	VOLUME HARVESTED	PERCENT MSO	SUITABLE ACRES AFFECTED	TERRITORY NUMBER
	Bird (FY 92)	MC	492	1430	100	492	080207, 080216, 080224, 080226, 080227, 0804052, 080274, 080280, 0804102, 0804103, 0804104;
	Hay (FY92)	MC	558	2286	92	513	080208, 080225, 080228,080278, 080281, 080285;
	Dry Canyon (FY92 or 1st of 93)	PP	152	300	100	152	080243

Table B15. Mexican spotted owl (MSO) Management Territory (MT) Number, total acreage, amount of suitable, capable and unsuitable habitat, size of the core area, amount of suitable habitat in the core area, size of the largest contiguous block of suitable habitat, amount of old growth present and the acreage of new activities in MSO habitat for activities proposed on the **Lincoln National Forest** in Fiscal Year 1992.

MANAGEMENT TERRITORY NUMBER	SUITABLE HABITAT	CAPABLE HABITAT	UNSUITABLE HABITAT	MANAGEMENT TERRITORY SIZE	CORE SIZE	SUITABLE IN CORE	OLD GROWTH	BLOCK OF SUITABLE	NEW ACTIVITIES
080243	1256	744	0	2000	450	450	0	1000	0
080411	1757	243	0	2000	450	450	0	1757	0
080435	1028	972	0	2000	450	450	0	1028	0
080438	1357	618	0	1975	450	450	0	1150	0
080455	1225	667	0	1892	647	400	0	1000	0
080456	1108	892	0	2000	450	400	0	810	23
080459	1041	959	0	2000	450	450	0	900	0
080498	1634	366	0	2000	450	450	0	1250	70
080208	1360	640	0	2000	450	450	0	1300	0
080225	1646	354	0	2000	450	450	0	1646	79
080228	1323	677	0	2000	450	450	0	1000	0
080278	1170	830	0	2000	450	450	0	475	71
080281	1447	553	0	2000	450	450	0	1200	0
080285	1491	509	0	2000	450	450	0	1260	174
080207	1482	518	0	2000	450	450	0	1482	16
080216	1491	509	0	2000	450	450	0	1491	88
080224	1491	509	0	2000	450	430	0	1400	28
080226	1487	513	0	2000	450	450	0	1400	17
080227	1418	582	0	2000	450	430	0	1336	52
080252	1336	629	52	2000	485	35	0	1170	0
080274	1227	758	15	2000	450	435	0	1227	70
080280	1134	866	0	2000	450	450	0	950	139
0804102	1656	344	0	2000	450	450	0	1220	0
0804103	1154	846	0	2000	450	450	0	1154	0
0804104	1477	523	0	2000	450	450	0	1400	128
080225	1696	354	0	2000	450	450	0	1646	79
0802013	1702	298	0	2000	450	450	-	-	88
0802040	1753	247	0	2000	450	450	-	-	0
0801001	1440	0	560	2000	450	400	-	-	0

MANAGEMENT TERRITORY NUMBER	SUITABLE HABITAT	CAPABLE HABITAT	UNSUITABLE HABITAT	MANAGEMENT TERRITORY SIZE	CORE SIZE	SUITABLE IN CORE	OLD GROWTH	BLOCK OF SUITABLE	NEW ACTIVITIES
0802085	1491	729	0	2000	450	450	-	-	174
0802020	1519	481	0	2000	450	450	-	-	0
0802041	1680	320	0	2000	450	450	-	-	0

Table B16. Conference category; name; habitat type; acres modified, volume harvested (MBF); percent of acreage modified in suitable Mexican spotted owl habitat; suitable acres affected; and, numbers of all Management Territories the activity would occur in for each proposed management activity on the **Santa Fe National Forest** in Fiscal Year 1992.

CATEGORY NUMBER	NAME	HABITAT TYPE	ACRES MODIFIED	VOLUME HARVESTED	PERCENT MSO	SUITABLE ACRES AFFECTED	TERRITORY NUMBER
1	Guadalupe	PP	249	2000	0	None	
	Seven Springs	PP	10	NA	100	10	
2	Austin Ranch	MC	16	91	100	16	
	Paddy	MC	10	100	100	10	
	Saaz	MC	10	100	100	10	
	Sandman	MC	41	400	100	41	
	Lucky	MC	23	150	100	23	
	Barillas (mistletoe treatments)	PP	188	250	0	None	
	Willow	PP/MC	85	250	100	85	
	Spring I-5	PP	70	500	100	70	
	Tumwater	MC	27	150	100	27	
	Middlefork	MC/PP	193	3800	100	193	
	Navajo/Deer	PP/MC	82	270	100	82	
	Bench	PP	20	300	100	20	
	Losposos	PP	19	20	100	19	
	Rio Medio	PP	76	60	100	76	

CATEGORY NUMBER	NAME	HABITAT TYPE	ACRES MODIFIED	VOLUME HARVESTED	PERCENT MSO	SUITABLE ACRES AFFECTED	TERRITORY NUMBER
	Canada DeOjitos	PP	80	60	0	None	
	Clara Peak	PP/MC	250	50	90	225	
	Borrego TSI	PP	20	0	100	20	
3	Calaveras (delayed FY91 sale)	MC/PP	575	4540	100	575	
	Cero Pavo	PP/MC	738	150	100	738	
	Maestes	PP/MC	739	1800	100	739	
	Pinabetal (delayed FY91 sale)	PP/MC	862	4000	67	577	
	Bales (delayed FY91 sale)	PP	465	2760	100	465	
	South Ojitos	PP	1054	3500	100	1,054	

Table B17. Conference category; name; habitat type; acres modified, volume harvested (MBF); percent of acreage modified in suitable Mexican spotted owl habitat; suitable acres affected; and, numbers of all Management Territories the activity would occur in for each proposed management activity on the **Tonto National Forest** in Fiscal Year 1992.

CATEGORY NUMBER	NAME	HABITAT TYPE	ACRES MODIFIED	VOLUME HARVESTED	PERCENT MSO	SUITABLE ACRES AFFECTED	TERRITORY NUMBER
1	Tract Sale 0048 FY 93	PP	3		0	None	
	Underwood Tractsale FY 93	PP	.4		0	None	
	405 RD Realign FY 92	PP	.8		0	None	
	Houston Mesa CG FY 93	PP	25		0	None	
3	Ashmo FY 92	PP	1183	1365	20	237	120406, 120409, 120410;
	Crouch FY 92	PP	1008	1600	9	91	120401, 120403, 120505, 120506;
	Wooffidd FY 93	PP	266	737	17	45	120405
	Rose FY 93	PP	925	2100	4	37	

Table B18. Mexican spotted owl (MSO) Management Territory (MT) Number, total acreage, amount of suitable, capable and unsuitable habitat, size of the core area, amount of suitable habitat in the core area, size of the largest contiguous block of suitable habitat, amount of old growth present and the acreage of new activities in MSO habitat for activities proposed on the **Tonto National Forest** in Fiscal Year 1992.

MANAGEMENT TERRITORY NUMBER	SUITABLE HABITAT	CAPABLE HABITAT	UNSUITABLE HABITAT	MANAGEMENT TERRITORY SIZE	CORE SIZE	SUITABLE IN CORE	OLD GROWTH	BLOCK OF SUITABLE	NEW ACTIVITIES
120406	1635	202	363	2200	530	530	0	1635	187
120409	1906	174	489	2569	465	465	0	1906	75
120410	1206	215	115	2536	988	500	0	273	215
120401	836	50	1140	2026	486	225	0	350	50
120403	1044	98	874	2016	470	460	0	1044	98
120405	944	115	960	2019	494	494	0	822	0
120406	1635	202	363	2200	530	530	0	1635	187
120405	944	115	960	2019	494	494	0	822	0